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VOL. XXIII. No. 1.

ARCHIVES OF OPHTHALMOLOGY.

ON UNILATERAL REFLEX IRIDOPLEGIA.

By Dr. HEDDAEUS, of Essen, Germany.

Translated by Dr. Ward A. Holden.

IT was formerly held, when with unilateral mydriasis the pupil showed no reaction to light, that the cause of the dilatation of the pupil was a paralysis of the iris branch of the third nerve at some point in its course between the sphincter and the nucleus. The diagnosis is made more certain when the mydriasis is accompanied by paralysis of the accommodation or of another branch of the third nerve. Doubt, however, has recently been thrown upon the diagnosis since Moebius and Seggel (these ARCHIVES, Germ. ed., xxiv., p. 234, xxvi., p. 151) stated their belief that in certain cases of so-called unilateral reflex iridoplegia, there exists a lesion outside the region of the third nerve in the centripetal portion of the reflex arc for the light reaction. In the following pages we shall try to discover whether rational grounds exist for such a supposition.

There have been reported to my knowledge the following five cases of reflex iridoplegia:

1. Heddaeus.[1] E., æt. thirty-five, tabic, chancre ten years previously, vision and fundus normal in each eye.

L absolute iridoplegia (6.4). The ciliary muscle is totally paralyzed, the internal rectus almost totally, the other muscles supplied by the third nerve paretic.

R reflex iridoplegia (4.0). The accommodative reaction occurs only with excessive accommodation. The accommodation itself is normal.

[1] *Berliner klin. Wochenschr.*, 1888, No. 18. Both cases from Graefe's clinic in Halle.

Four weeks later: All extrinsic muscles normal. Both pupils immovable (L 5.6; R 4.0). R accommodation normal; three weeks later required + 0.75 for near; six weeks later + 1.75.

2. Heddaeus.[1] Mrs. D., æt. thirty-two, previously healthy; L slight paresis of third nerve. V, accom., etc., normal in each eye.

L pupil of normal size and mobility (6.0, 3.2).

R reflex iridoplegia (6.0, 6.0).

The accommodative reaction in the right eye tested in the usual way is very slight. With excessive accommodation both pupils contract to 2.6 *mm.* After the accommodation is relaxed, the right pupil slowly enlarges, and regains its previous size after about two minutes.

3. Moebius.[2] Tabic patient, æt. thirty-four, syphilitic infection ten years previously. Eyes normal excepting the pupils. The left, narrower, pupil, responds to light; the right, larger, not. Accommodative reaction prompt and complete.

4. Seggel. An officer, æt. thirty-three, tabes doubtful, never infected with syphilis. After a paralysis of all branches of the L third nerve, there remained paresis of the L inferior oblique and pupillary disturbances.

R pupil of normal size and mobility (5, 2.5 *mm*).

L pupil dilated, and not responsive to light (5, 2.5 *cm*).

Accommodative reaction prompt and energetic on both sides.

5. Lyder Borthen.[3] A pilot, æt. thirty-seven, infected nineteen years before, a tabic paralytic. V, accom., etc., normal.

R pupil of normal size (2.0), direct reaction good, consensual reaction diminished.

L pupil (4.5), reflex iridoplegia, contracts slowly to 3 *mm* with accommodation.

No one would refuse to consider all these five cases as cases of incomplete nuclear paralysis of the third nerve if the accommodative reaction had been abolished as well as the light reaction. The former was always at least partially preserved, however, and that fact is hard to reconcile with a paralysis of the sphincter nucleus. If, as is usually sup-

[1] *Berliner klin. Wochenschr.*, 1888, No. 18. Both cases from Graefe's clinic in Halle.

[2] *Centrabl. f. Nervenheilk. und Psych.*, 1888, No. xxiii.

[3] Zehender's *Monatsbl.*, April, 1892.

posed, the sphincter nucleus receives impressions on the one hand from centripetal pupillary fibres reaching it from both sides, and on the other hand from the accommodation nucleus of the same side, it is difficult to understand how with an affection of the sphincter nucleus the transmission of the accommodative impulse to the pupil may be possible, while the transmission of the light stimulus is interrupted.

Moebius and Seggel[1] avoid this difficulty by locating the affection in Meynert's centripetal pupillary fibres, which enter the sphincter nucleus from both sides. This explanation, however, supposes the existence of two foci to account for one symptom. Seggel recognizes this weak point, and endeavors to simplify the matter by supposing, with Duval, that there is no central connection between the two nuclei of the third pair. This idea is untenable, however. Each sphincter nucleus must be in connection with the pupillary fibres of the same side, and also with those of the other side. This is proven by a case of Weir Mitchell's, in which the chiasm was divided by an aneurismal tumor so that the nerve and tract of each side were completely separated from those of the other. In life there was bitemporal hemianopsia, and normal pupillary reaction. Here the consensual pupillary reaction could only have been possible through a central connection of the pupillary fibres of one side with the nucleus of the other side. Therefore, for Seggel's explanation we must assume two foci, between which the healthy sphincter nucleus lies. The explanation is not satisfactory, and the less so since every unprejudiced observer would suppose the mydriasis to be a symptom of paralysis of the third nerve.

Since in all the cases of unilateral reflex iridoplegia hitherto published the accommodation was intact, it seems natural to suppose a mechanical influence of the accommodative branch of the third nerve on the contraction of the pupil. And Knies[2] believed that the accommodative contraction

[1] *Cf. Arch. f. Augenheilk.*, xx., p. 51.

[2] *Journal of Nervous and Mental Disease*, January, 1889. Knies, Die Beziehungen des Sehorgans, etc., zu Krankheiten des Körpers, etc., pp. 24 and 119.

of the pupil was brought about mechanically, the contraction of the ciliary muscle momentarily forcing blood into the iris. If this were the case, whenever the accommodation was preserved the accommodative pupillary reaction should be preserved. In one of my cases (Case 1), at the second examination the accommodation was intact, and, nevertheless, there was no trace of accommodative pupillary reaction. This explanation is therefore untenable.

Lyder Borthen, after much discussion of his case, concludes that the dilatation of the pupil is probably due to a paralysis of the sphincter nucleus. He pays but little attention to the preserved accommodative pupillary reaction in this affection, referring to the view of the later investigators, that the sphincter nucleus consists of two portions.

When we study Perlia's[1] well-known scheme of the nuclei of the third and fourth nerves, another possible explanation suggests itself, viz., that the nuclei do not stand in direct connection with each other, so that the sphincter nucleus cannot be irritated by the accommodation nucleus, but that the iris branch of the third nerve is composed of two roots, one from the sphincter nucleus (x), and one from the accommodation nucleus (y). Destruction of the sphincter nucleus or of the root (x) arising from it produces typical, unilateral reflex iridoplegia, together with a moderate mydriasis. If y be also affected, the accommodative reaction is abolished also and we have absolute iridoplegia, and the pupil may become somewhat wider. The accommodation remains intact so long as the other branch arising from the accommodation nucleus, the ciliary or accommodative branch (z) of the third nerve, be not affected. Destruction of z alone would produce a slight dilatation of the pupil and the abolition of the accommodative reaction, with preservation of normal accommodation and normal reaction to light—a condition never observed. The fact that the individual bundles, x, y, and z, are so rarely separately affected, is explained by their close proximity to one another.

The supposition of a fascicular instead of a nuclear affection, for example in Seggel's case, in which at first all

[1] Arch. f. Ophth., xxxv., 4.

branches of the third nerve were paralyzed, would be acceptable to such as, with Perlia, Knies, and others, believe that the third nerve of one side arises in great part from the nucleus of the same side, and in lesser part from the nucleus of the opposite side.

This seems to me *a priori* to be the most plausible explanation, and none the less so since it permits us to put into one category the various cases described as reflex iridoplegia, which evidently, both etiologically and anatomically, belong together. I shall not attempt to decide whether it be advisable to include them all under the name reflex iridoplegia, and separate them from the great group of nuclear paralyses.

According to this explanation the cause of the unilateral reflex iridoplegia may lie entirely in the centrifugal portion of the reflex arc for the light reaction, as was stated in the first paragraph of this paper. Then, there being a lesion of the branch x, the reaction of the pupils to light would be the same as when the third nerve of this side was totally paralyzed. The dilated pupil would not respond to light directly or consensually; the other pupil would appear somewhat narrowed and would react consensually more readily than directly, since the pupil of the paralyzed eye allows a greater amount of light to reach the retina. This was seen in Seggel's case and in my second one. For the same reason, when the paralysis of the sphincter was not complete the pupil would react better directly than consensually. This was seen in Redlich's case:

A paralytic patient, æt. forty-three, with left reflex iridoplegia. The right pupil narrower than the left; direct reaction marked, consensual reaction very marked; with left direct reaction very slight, consensual reaction completely wanting.[1]

This is not surprising since, according to our supposition, the centripetal pupillary fibres of both sides, the nuclei of both sides, and the centrifugal course of the sound side are intact. It is otherwise when the central lesion extends from x to the sphincter nucleus itself. Then, as I have elsewhere

[1] *Neurolog. Centralblatt*, 1892, part 10.

shown, according to our scheme, the transmission of the light irritation from the side of the paralyzed eye to the nucleus of the other is rendered difficult, so that the consensual reaction of the pupil of the sound eye is weakened (Borthen's case) and finally completely abolished. If, however, the other scheme be the true one, a nucleus, together with the pupillary fibres running to it from both sides, may be destroyed without abolishing the consensual reaction of the pupil of the other eye. The preservation of the consensual pupillary reaction of the sound eye in cases of unilateral reflex iridoplegia does not prove the semidecussation of the centripetal pupillary fibres in the chiasm, as has been taken for granted by many (Moebius, Redlich, Jessup). The case of Borthen speaks against such a semidecussation, since on this supposition we could not explain it.

Berger[1] states that he has observed unilateral reflex iridoplegia twice. In one of his cases the pupil reacted consensually. This case was, properly speaking, not one of reflex iridoplegia, for according to all authors we have to do with unilateral reflex iridoplegia when one pupil of an individual does not change its size with varying degrees of illumination of both eyes, but reacts to accommodation. Moebius and Seggel require that the accommodative reaction be good. The absolute width of the pupil is not taken into account. The reflex iridoplegic pupil may be wider or narrower than the other, but in all the cases hitherto published it has been dilated. The other pupil is freely movable in uncomplicated cases; in my Case 1 it was immobile. If with complete absence of light reaction one pupil reacts to accommodation and the other not, we have either (*a*) reflex iridoplegia of the one and absolute iridoplegia of the other pupil; or we have (*b*) absolute iridoplegia of one pupil, combined with bilateral reflex blindness (numbness)—a condition which might be produced by a tumor that rendered incapable of conduction on the one hand the third nerve of one side, on the other hand both optic nerves, and with them the centripetal pupillary fibres. In my Case 1 the differential diagnosis between *a* and *b* could not be difficult.

[1] *Arch. f. Augenheilk.*, xix., 4, p. 400.

I would now speak of some errors which appear in Seggel's communications in regard to my earlier studies. From what precedes it is evident that I do not deny the existence of unilateral reflex iridoplegia, and that I did not give Case 1, as he believes, as proof against, but as a paradigm of, unilateral reflex iridoplegia. I had not, and have not yet, seen a case with the accommodative reaction so well preserved as in Seggel's case. From my own experience I then stated that, so far as my knowledge went, such cases did not exist.

Seggel therefore ascribed the differentiation between reflex blindness and reflex iridoplegia to Moebius. I would, however, myself claim the credit for first having pointed out the distinction, for this was the purpose of my paper in the *Berliner klinische Wochenschrift*, as is indicated by the title, "Reflex Sensibility, Reflex Blindness, and Reflex Iridoplegia." In distinction from reflex iridoplegia I gave as a paradigm of unilateral reflex blindness a case of left-sided embolism of the central artery of the retina. Both pupils are equally large, and respond equally with changes of illumination in both eyes, or with changes of illumination for the right, healthy, eye, but when light falls into the left eye no pupillary reaction follows.

With unilateral reflex iridoplegia, on the contrary, the pupils differ in size, and when both eyes are illuminated only one pupil reacts, and this one also responds to isolated illumination of each eye. Both pupils react with accommodation.

No one can confuse these two conditions. If on the one hand one supposes an embolism of the central artery, and on the other hand the affection in Seggel's case, bilateral, each case will show the same picture: Both pupils wide, not responsive to light, reacting with accommodation, *i. e.*, what is commonly called "reflex iridoplegia." From this it is evident that with this symptom-complex the differential diagnosis must be made between bilateral reflex blindness and bilateral reflex iridoplegia.

In the ordinary form of bilateral reflex iridoplegia the pupils are small, but dilate readily and completely under

cocaine, and with this dilatation, as I have many times observed, frequently regain their mobility to a considerable degree, and again respond both to light and to accommodation. From the latter circumstance it follows that the lack of mobility is due to the narrowness of the pupil, and from the dilatation under cocaine we must conclude that the narrowness is not due to paralysis of the sympathetic, but to irritation of the third, as I have endeavored to explain in greater detail in the *Berliner klinische Wochenschrift*, No. 17 and 18, 1886.

A SUGGESTION OF AN OPERATION TO CORRECT ASTIGMATISM.

By W. H. BATES, M.D.,

ASSISTANT SURGEON, NEW YORK EYE INFIRMARY.

IT has long been known that the contraction of corneal scars produces permanent corneal astigmatism. The following cases furnished facts which suggested the operation.

CASE 1.—Mr. H., aged twenty-four, came to the New York Eye Infirmary, service of Dr. Noyes, in June, 1890, with a small piece of iron imbedded in the upper pupillary margin of the iris. Atropine was prescribed. Several weeks later, vision $\frac{20}{40}$, not improved by any glass. The nerve looked round with the ophthalmoscope. Under ether a corneal section was made with a Gräfe knife over the foreign body at an axis of 45°.

The foreign body was removed and a piece of iris with it. One month later, eye quiet, vision $\frac{1}{200}$; with a convex cylinder of 9. D. axis parallel to the corneal section (45°), combined with — 5. D. S., vision is $\frac{20}{30}$. The effect of the incision was to produce 9. D. of (regular) astigmatism. With the ophthalmoscope, the optic disc is decidedly oval at 45°. The iris is caught in the wound.

CASE 2.—Mrs. D. (a patient of Dr. R. H. Derby), aged fifty, has been operated upon for glaucoma of the left eye. There is beginning glaucoma of the right eye.

February 8, 1891.—Vision of the right eye is normal and no glass is accepted. The ophthalmometer showed no corneal astigmatism. She has been tested a number of times with the same result.

February 10th.—Iridectomy upwards with a corneal section.

March 5th.—Right vision $\frac{20}{40}$; with a convex cylinder of 2.75 D. axis 15°, combined with — 1.75 D. S., vision $\frac{20}{20}$.

Iris is caught in the wound.

The ophthalmometer showed the astigmatism to be all corneal, the meridian of least curvature being at right angles to the corneal wound.

March 26th.—The astigmatism is less. Vision $\frac{20}{60}$, with a convex cylinder of 2. D. axis 15° combined with − 1. D. S. The astigmatism is the same with the ophthalmometer.

May 30th.—Two months later, the astigmatism had not changed, and the glasses were prescribed. Subsequently the patient came back and received glasses for reading, at which time the astigmatism had not changed.

CASE 3.—Mrs. U., aged forty-nine, has glaucoma of the left eye. Treated by Dr. Weeks.

April 7th.—Vision of the right eye normal, no glass accepted. Vision of the left eye $\frac{20}{400}$, not improved by glasses.

May 15th.—Iridectomy upwards with a corneal section. Two weeks later, a sclerotomy below.

June 30th.—Vision of the left eye $\frac{20}{200}$ +; with a convex cylinder of 2.25 D. at 180° combined with − 1.25 D. S., vision is normal, $\frac{20}{20}$. The ophthalmometer showed that the astigmatism was all corneal. Iris is caught in the wound.

Tension of the eyeball +.

August 4th.—One month later, the corneal astigmatism, as shown by the ophthalmometer had not changed. Left vision $\frac{20}{200}$; with a convex cylinder of 2.25 D., combined with − 2. D. S., vision is $\frac{20}{40}$ −. Tension still +.

CASE 4.—Mr. H., aged thirty-eight, was injured June 27, 1891, in the right eye by a champagne bottle bursting. There is a linear corneal scar axis 120°. The iris is caught in the wound.

July 7th.—Vision of the right eye, which the patient says was good before the injury, is now $\frac{20}{50}$ −, with a convex cylinder of 1. D. axis parallel to the corneal section, 120°, combined with − 1. D. S., vision is $\frac{20}{30}$. Eye is still inflamed.

The ophthalmometer showed the astigmatism to be all corneal, the meridian of least curvature being at right angles to the corneal wound. The left eye is normal.

CASE 5.—Mrs. A., aged fifty-five, was seen February 19, 1892. Right vision with + 2.75 D. S. = $\frac{20}{20}$. Left vision with + 2.75 D. S. ⊃ + 1.5 D. C. 15° = $\frac{20}{30}$ −. The eye which has the astigmatism has a linear scar on the cornea at an axis of 15°. The ophthalmometer showed the astigmatism to be all corneal. This

case suggests the fact that the incision at 15° produced a regular astigmatism by shortening the radius of curvature of the meridian at 105° without lengthening that of the meridian at 15°.

CASE 6.—Mr. B., aged sixty-four, was seen October 10, 1893. Right vision with + 4.5 D. S. = $\frac{10}{15}$ −. Left vision with + 4. D. S. ⊃ + 4.5 D. C. 105° = $\frac{20}{40}$ −. The patient complained that the vision of the left eye had failed in recent years. He has a pterygium of the left eye at an axis of 15°. The radius of curvature of the meridian of 15° was lengthened without appreciably shortening that of the meridian at 105°.

PROPOSITIONS.

1. A corneal incision lengthens the radius of curvature of that corneal meridian which is at right angles to the line of the incision, and does not flatten any other meridian. The astigmatism produced is a regular astigmatism, and is corrected by a convex cylinder at an axis parallel to the line of the incision.

2. The immediate result is greater than the ultimate result.

3. The astigmatism produced is permanent after a length of time—at least a month after the cornea has healed. There may be at first 3. D. of astigmatism produced. At the end of a month, there may be 2. D. At the end of three months, the astigmatism may still be 2. D., and this amount of astigmatism will be permanent.

4. The amount of astigmatism produced is greater the nearer the incision is to the centre of the cornea. As much as 9. D. can be produced.

5. Mixed astigmatism occurs: (*a*) temporarily; (*b*) with incarceration of the iris.

A study of Case 3 would show that Proposition 1 still holds true, and that the myopia is due to other causes than the cornea. The myopia is due to swelling of the lens or to lengthening of the eyeball.

The operation suggested.—Incisions of the cornea are made at right angles to the most convex meridian. The amount of correction can be regulated by the number, depth, and location of the incisions.

The operation promises a permanent effect. The risk to

the eye is not great. It is not as dangerous an operation as the operation for iridectomy, which is usually performed without accident. Incarceration of the iris must be avoided to prevent the development of myopia.

The operation was performed tentatively on the two following cases.

Case A.—Miss K., aged fourteen, had compound myopic astigmation. October 30, 1891, the left eye was found by the ophthalmometer to have 2.5 D. of astigmatism with the meridian of greater curvature at 75°.

November 2d.—The first corneal incision was made. A strip of ordinary adhesive plaster was prepared $3'' \times \frac{1}{4}''$. This was applied below the eye to act as a guide to the incision to be made. The plaster was applied at an axis of 165°. Cocaine, 2 %, was dropped into the eye for fifteen minutes. No speculum or fixation forceps was used. The incision was made with a Graefe cataract knife held parallel to the plaster at an axis of 165°, the edge of the knife cutting the cornea from without inwards. No pain was produced.

There was no escape of aqueous. Bandage was applied.

November 3d.—There was some photophobia after the removal of the bandage. No reaction.

November 8th.—For the first time the vision of the left eye was equal to that of the right eye. The ophthalmometer showed no change in the corneal astigmatism.

November 10th.—Operated as before, but the incision was made deeper and nearer the centre of the cornea. There was no escape of aqueous. Bandage.

November 11th.—After the removal of the bandage there was more photophobia than after the first operation. The eyelids were slightly swollen. The eye felt sore. The ocular conjunctiva was not red. Recovered in a few hours. The bandage was not reapplied.

November 30th.—Incision repeated. No bandage was applied, and there was no reaction and no pain.

January 8, 1892.—Incision repeated.

January 25th.—Incision repeated. No bandage was applied after the two last incisions, and there was no reaction.

No effect on the corneal astigmatism could be discovered with the ophthalmometer.

April 24, 1893.—The vision of the operated eye is still certainly improved. No scar can be observed by ordinary inspection.

CASE B.—Dr. S., aged twenty-three, has been wearing — 1.25 D. S. ⊃ — 0.75 D. C. 100° for both eyes. The astigmatism cannot be determined with the ophthalmometer.

April 7, 1893.—A slight corneal incision was made on the right eye at an axis of 100°. The incision was made on the temporal side of the cornea. No bandage. No reaction after the operation.

April 8th.—The left eye was operated upon in the same manner. There was no reaction.

October 19th.—The vision of the patient without glasses is better. No trace of the incisions can be made out by ordinary inspection.

THE CAUSES OF BLINDNESS IN ONTARIO.

By A. B. OSBORNE, M.D.,
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EARLY this year, under instructions from the Ontario Legislature, I examined the eyes of the pupils in the Provincial Institution for the Blind at Brantford. This examination was held with the purpose of ascertaining and classifying the various causes of blindness among the students. The standard of blindness necessary for admission to the institute is: "Such defective vision as renders education by ordinary means impossible." The pupils are all young or of such an age as admits of their receiving an education, hence there is an almost total absence of the diseases of middle or later life. For this reason deductions from this paper must not be considered as applying to the entire blind in the province.

The number of pupils examined was 132, 77 males and 55 females.

Congenital and Lamellar Cataract heads the list with 29 cases, or almost 22 per cent. of the whole number, equally divided between the sexes. These 29 cases represent 26 families, in 8 of which the disease existed in more than 1 member; in 2 of these families the parents were more or less distantly related before marriage, while in 2 of the cases 1 of the parents had cataract. Among these cases of cataract are 17 which have been operated upon; of these the vision was improved in 11, doubtful in 4, and lost in 2. One case had both eyes operated on, 1 being improved and the other lost. The operations were mainly discisions

with a few iridectomies. Nystagmus existed in all of these cases. The most noteworthy point is the fact that in 7 of these cases cataract appeared in more than 1 child of the same family. No notes were made as to the condition of the incisor teeth.

Ophthalmia Neonatorum is second on the list, claiming 21 cases, or 16 per cent. The disparity between the sexes is very marked—13 being males to 8 females. Of these 21 cases 6 were the first-born, 2 the second-, 4 the third-, 4 the fourth-, 1 the sixth-, 1 the eighth-, 1 the tenth-, and 2 unknown. The actual condition of the 42 eyes at the time of examination was: shrunken ball 17, anterior staphyloma 10, opaque cornea with anterior synechiæ 7, opaque cornea 6, anterior polar cataract 1, removed 1. The occurrence of anterior polar cataract is noteworthy.

Atrophy of the Optic Nerve caused 15 cases, or 11.36 per cent. Of these 11 are males and 4 females. Seven of these, viz., 6 males and 1 female, are reported as born blind, 1 went blind in her first year, 3 when five years of age, and 1 when eight years old; the other 3 occurred after the age of puberty, 1 being attributed to contracted syphilis, 1 to brain tumor, and 1 to brain fever. Excluding the last 3 cases, which are secondary to diseases of adult life, there are 12 cases blind under nine years of age. These 12 cases represent 10 families. In 2 of these families the parents were related, and in 1 of these 2 families 2 children were born blind. In another family 3 children were born blind. One case which became blind at five years of age has a history of syphilis in the father. One born blind is reported mentally defective. So that in 10 families 2 have a history of consanguinity in the parents, 1 of syphilis, and 2 show more than one member blind. It is probable that syphilis plays a more important role than is here shown.

Sympathetic Ophthalmia is fourth on the list with 10 cases, or 7.5 per cent. Of these 6 are males and 4 females. In 6 cases there is a history of a penetrating wound, in the other 4 the nature of the injury is unknown. The amount of vision remaining varies from absolute blindness to ability to count fingers at a few feet. One of these cases is reported

as having 1 eye injured while being delivered—probably by instruments;—its fellow became blind within a month; in all the other cases, with 1 exception, sympathetic ophthalmia occurred within a year of the injury. The exception is a young woman, age twenty, whose left eye was injured when four years old; the vision of the right has gradually failed till now she can only count fingers at 2 feet. In 6 of these cases the injured eye was removed, but no history can be obtained as to the condition of the sympathizing eye at the time of operation, or as to the lapse of time between the injury and the operation. In 1 case the injured eye retains some perception of light, while the sympathizing eye is absolutely blind. The condition of many of the eyes lost through sympathy is similar, viz., opacity of lens, adhesions between iris and lens, and greatly reduced tension of the ball, amounting almost to flaccidity.

Direct Injury to the eyes claims 9 victims, 8 males and 1 female. The female is said to have had her eyes wilfully destroyed in infancy by her insane nurse, who forced them out. Gunpowder explosions caused 3 cases; in 1 of these the lids are completely adherent to the ball, which still retains good perception of light through the lids.

Trachoma or Granular Conjunctivitis caused 9 cases, 6 males and 3 females. One aged twenty-five is reported as becoming blind when six months old; he has opacity of both corneæ with entropion of the left lids. Another aged twenty-four became affected at eleven months; 1 ball is shrunken and the other cornea is opaque; the others were attacked at five, six, eight, ten, thirteen, sixteen, and eighteen years of age respectively. At present their ages vary from sixteen to twenty-five years. In all of these eyes the cornea is opaque, 4 are noted as having entropion, and 2 have pannus. One case had 1 eye removed, 2 others have each a shrunken ball.

Retinitis Pigmentosa is the cause of 7 cases, 3 males and 4 females. These 7 cases represent 3 families, 4 belonging to 1, 2 to another, and 1 to another. In 2 of these families the parents were cousins, and in the third they were half cousins. The ages of these cases vary from nine to

nineteen years, and all are reported as being blind or having defective vision at the time of birth; the best vision possessed by any of them is ability to count fingers at six inches. One is subject to epileptic fits.

Congenital Defects—Microphthalmos and Coloboma Iridis—cause 4 cases and 1 case respectively. In none of these is there any history of parental syphilis or consanguinity. The 4 cases of microphthalmos represent 4 different families, and in only 1 of these is more than 1 member afflicted. In that 1, 3 brothers are reported born blind.

Malignant Myopia caused 3 cases, which represent 3 families, in each of which 1 parent had defective vision.

Hereditary Syphilis produced 2 cases, both female. Each of these has opacities of the corneæ, and 1 has posterior synechiæ.

Among the 8 unclassified cases are 2 in which the disease began within the first six weeks of life and the balls became shrunken; these were probably cases of ophthalmia neonatorum. The others must remain unclassified at present.

	Males.	Females.	Total.	Per cent.
Congenital and Lamellar Cataracts.	15	14	29	21.96
Ophthalmia Neonatorum	13	8	21	16.06
Atrophy of Optic Nerve	11	4	15	11.36
Sympathetic Ophthalmia	6	4	10	7.57
Traumatism	8	1	9	6.82
Trachoma	6	3	9	6.82
Retinitis Pigmentosa	3	4	7	5.3
Scarlet Fever	1	3	4	
Microphthalmos	2	2	4	
Malignant Myopia	2	1	3	
Syphilis	..	2	2	
Perforating Corneal Ulcers	..	2	2	
Irido-Cyclo-Choroiditis	1	1	2	
Xerosis	1	..	1	
Detachment of Retina	1	..	1	
Attributed to Diphtheria	1	..	1	
" Measles	..	1	1	
" Smallpox	1	..	1	
Coloboma Iridis	..	1	1	
Intra-Uterine Keratitis	..	1	1	
Undetermined	5	3	8	
	77	55	132	

MINOR PLASTIC OPERATIONS ABOUT THE EYE.

By H. GIFFORD, Omaha, Neb.

I.

MODIFICATIONS OF THE ORDINARY OPERATION FOR CANTHOPLASTY.

IN cases where there is plenty of conjunctiva, the ordinary operation, consisting in lengthening the palpebral fissure and putting in three stitches, needs no change; but in regions where trachoma is prevalent, one not infrequently meets cases in which the palpebral fissure is very much reduced in length, while the conjunctiva is so atrophic that, after lengthening the fissure, one cannot easily get enough membrane to prevent the cut from growing up again. In such cases, I have been covering the cut surfaces made by lengthening the fissure with two small Thiersch flaps, the surfaces being first widened slightly by turning out the skin above and below with stitches, the needle being first passed through the skin at the edge of the cut, then over a small roll of wet cotton and through the skin again beyond the roll. I have done six operations in this way, without having the flaps fail to heal in any instance. One of the patients I have just seen after the lapse of a year, and the result continues to be excellent.

In cases where entropium and trichiasis co-exist with partial anchyloblepharon, I commonly first lengthen the palpebral fissure, then split the edge of the lid, as in Flarer's operation, extending the incision at the outer extremity until it passes into the raw surface made by the cut to

lengthen the fissure; then, after turning back the outer flap with stitches passed over a cotton splint, as before described, the gap in the edge of the lid is filled with a Thiersch flap or a strip of lip membrane, cut long enough to extend clear to the extremity of the newly lengthened palpebral fissure. The flap thus maintains both the eversion of the lid border and the increased length of the fissure.

II.

THE USE OF THIERSCH FLAPS IN REPAIRING LOSSES OF CONJUNCTIVA.

To any one used to working with Thiersch flaps, they at once suggest themselves for repairing losses of conjunctiva, but I must confess that my own experience with them in this direction, while on the whole satisfactory, has not been so satisfactory as I expected it to be. After seeing how invariably they healed in, and how well they kept their size and shape in other operations, I determined to use them in restoring the conjunctival sac in cases where shrinkage or accident had rendered the wearing of an artificial eye impossible. In my first case, I obtained quite a brilliant result.

A laborer had lost his right eye by having it burnt with hot metal, and when I saw him, some years after the accident, I found the conjunctival sac considerably reduced in extent, with a broad band of cicatricial tissue extending perpendicularly across it, entirely preventing the introduction of an artificial eye. This band was deeply divided and the lids held apart to make the wound gape, while a Thiersch flap from the arm was slid into place and held there by a small roll of iodoform gauze, the latter being itself held in place by cotton applied outside the lids. The flap healed perfectly, and the man has since ($2\frac{3}{4}$ years) been able to wear a very respectable-looking glass eye.

My next experience was by no means so gratifying.

A man who had lost his right eye in early youth, had for a number of years been unable to wear an artificial eye, on account of

atrophy of the conjunctiva in all directions. I enlarged the socket by deep incisions into the sub-conjunctival tissues and slid Thiersch flaps into these; to my surprise, they either failed entirely to heal or healed in so scattering a way that very little was gained by the operation. A repetition of this performance met with but little better success.

Much previous experience with these flaps had convinced me that they will always heal on if they can be accurately applied to a raw aseptic surface and kept there for forty-eight hours; the only explanation of their failure in this case was the difficulty of applying them accurately to the walls of the narrow crevices which I had cut into the sub-conjunctival tissue.

In order, therefore, to enable the flaps to be more accurately adjusted and held in position, I tried the following method: Deep incisions were made into the sub-conjunctival tissue as before, and these were firmly packed with iodoform gauze, and left so for forty-eight hours. On removing the gauze, at the end of this time the walls of the crevices remained so widely spread apart that after freshening the surfaces with a sharp spoon, the flaps could be adjusted with perfect accuracy, and small rolls of gauze could easily be introduced to hold them in place. This time the healing was much more satisfactory, and enough space was gained to allow the introduction of a very decent-looking eye. There was, however, considerable subsequent contraction, and the final result, though a decided improvement, could hardly be called brilliant.

I have since operated on three other sockets in a similar way, and in all of them the flaps healed in nicely. In one of them the final result was as good as in my first case, the patient being able to wear an excellent-looking eye after the operation. This case also resembled Case 1 in that the main obstruction to the introduction of an artificial eye, before the operation, was a broad cicatricial band. In the other two cases where the contraction was uniform, as the result of trachoma, the flaps, although healing in well, underwent rapid contraction (the result, I take it, of the yielding

sub-structure) so that in the end but little room was gained.

The first two of the above operations were made in the spring of 1891, two years before the appearance of Dr. Hotz's report of a similar case (*Ann. Ophth. and Otol.*, April, 1893).

III.

THE COMBINATION OF WOLFE AND THIERSCH FLAPS FOR CICATRICIAL ECTROPION.

My experience with Wolfe flaps (*i. e.*, whole skin flaps, without pedicles) has been that while the lower layers of the flap are healing on, the upper layers die; so that although the results, at first, appear perfect, much shrinkage is sure to result, what is finally left of the flap being little more than a broad scar. Of course even this may sometimes give a good result if room can be obtained for a sufficiently large flap to start with, but it occurred to me that much of this shrinkage might be prevented by a combination of the Wolfe and Thiersch flaps. Accordingly, in two cases of extreme ectropion of the upper lid which I had failed to relieve by the use of Thiersch flaps alone, I first put in a Wolfe flap, and after eight or nine days, when the breaking down of the epithelium of the flaps indicated the usual necrosis of the upper layers, I scraped and cut these away until healthy bleeding tissue was reached, and then applied a large Thiersch flap. In one case, the latter healed well and a good result was obtained; in the other the dead tissue was not cleared away sufficiently, and the Thiersch flap healed only in spots, the final result, however, being very fair.

In moderate degrees of ectropion of the lower lid, I have had a number of excellent results with Thiersch flaps alone, without adding a tarsorraphy, but where the upper lid is affected, the constant pulling up of the lid seems to favor a shrinkage, or rather a wrinkling up, of the flaps; for in the two cases in which I used them alone without tarsorraphy, the beautiful results which persisted for the first two weeks,

were vitiated by the surface being thrown up into ridges, parallel with the lid border, through contraction of the sub-epithelial tissue. This tendency makes the greater body offered by the Wolfe flap very desirable, especially since its surface-shrinkage can be reduced by the secondary application of a Thiersch flap. As the secondary flap can be obtained practically without pain, by injecting cocaine into (not under) the skin, its use makes but little extra strain on the patient's endurance.

In this connection a point which has occurred to me, but which I have only partially put into practice, is that in extreme cases it is well to obtain room for as large a flap as possible by temporarily fixing the edge of the loosened lid low down to the cheek or high upon the brow, by a few sutures. After a week or two, these sutures having been removed and a certain amount of contraction having taken place, the usual tarsorraphy can be performed, and the lids left united until a permanent result is assured.

PAPILLOMA IN THE SCLERO-CORNEAL REGION.[1]

By DAVID COGGIN, M.D., of Salem, Mass.

March 2, 1891.—Mr. W., age sixty years, American master-currier.

Ectropium of the right lower eyelid, which followed the removal of a tumor from the cheek many years before. Within a year he first noticed a growth on his right eye in the upper and outer sclero-corneal junction, which was accompanied by a sense of discomfort only. Its surface was smooth, vascular, elevated about 2 *mm*, and nearly 1 centimetre in diameter, and attached to both the ocular conjunctiva and the cornea, and extending on the latter to the pupillary border. At first glance it somewhat resembled a dense pannus, but there was present no trace whatever of either trachoma or conjunctivitis. Vision $= \frac{4}{12}$.

April 28th. Cocaine was applied and the growth was literally peeled from the cornea with a curette, after first cutting through its peripheral attachment, and the same procedure was followed in removing the scleral portion.

No conjunctiva was recognized. The corneal surface was left as smooth as if still covered by its epithelial layer, excepting at the line where the tumor terminated, but the denuded scleral surface was highly vascular and ragged.

Recovery rapid, and the parts soon presented a normal appearance.

In May, 1892, the little neoplasm had returned on the former site, but it extended below the equator.

It was removed as before—pieces 3 to 8 *mm* in diameter, being torn or peeled off. Mitigated silver (1–2) was again thoroughly applied on the scleral surface, and the healing process went on

[1] Read before the New England Ophthalmological Society, January 2, 1894.

normally. Five months later the trouble was worse than ever, as it had extended so far downwards and inwards as to nearly cover the pupil. V = $\frac{5}{60}$.

After operating again and when recovery had taken place, with a + 1.5 D^c glass, axis vertical, V = $\frac{6}{6}$ (+ .75 = $\frac{6}{6}$ left eye).

Last July, for the fourth time, a growth was removed from the same site, though it was smaller than on the previous occasions. When last seen the sclero-corneal limbus presented a normal appearance.

On examining the several specimens they were found to be neither epithelioma nor sarcoma, so they were sent to Dr. W. F. Whitney, of the Harvard Medical School (together with others from a nearly parallel case of a man seventy-eight years of age—a New England farmer—who had been twice operated upon; the first operation was preceded by a peritomy, as the appearance so closely simulated a thick pannus, but it naturally had no effect. Both growths were on the superior limbus). He reported that they were all similar in character, being composed of "irregularly thickened masses of large, flat epithelial cells situated about a vascularized centre of loose connective tissue, and the growths seemed to be a simple hypertrophy of the epidermis and papillary layers of the conjunctiva."

In the ARCHIVES, January, 1892, Dr. Sims, of Mobile, reported two cases of nearly analogous papillomatous growths that were operated upon by Professor Fuchs, of Vienna, and in the last report of Dr. Knapp's Ophthalmic and Aural Institute a case of this apparently rare affection is recorded.

CONGENITAL, BILATERAL, AND SYMMETRICALLY PLACED FISTULÆ OF THE LACHRYMAL SACS.

By CASEY A. WOOD, C.M., M.D., of Chicago.

MANZ[1] considers it at least doubtful whether there is such a thing as congenital fistula of the sac, but, admitting its possibility would regard it as an arrest of development, an imperfect closure of the groove which, in the embryo, runs from the eye to the olfactory pit. De Wecker,[2] on the other hand, instances a number of cases from the writings of G. Beer, Scarpa, *et al.*, and says of them that the openings were all of the capillary variety; the lachrymal fluid did not discharge through the defect in its walls, except during crying, or when a gentle pressure was made over the region of the sac itself.

An example of "double lachrymal fistula (probably congenital)" is described by Hartridge,[3] but few and imperfect details of the case are furnished. Agnew,[4] however, gives us a more perfect picture of a three-year-old girl, entirely healthy, who had no other congenital defect, and had never shown any sign of inflammation in or about the eyes. On either side, immediately under the central portion of the *lig. palpeb. int.*, there was a capillary opening in the skin, from which discharged, especially after crying

[1] Graefe-Saemisch, *Handbuch der g. Augenheilkunde*, ii., 113.

[2] *Traité Complet d'Ophtalmologie*, iv., 1103.

[3] *Trans. Oph. Soc. United Kingdom*, xii., 172.

[4] A case of double, extremely minute, and apparently congenital lachrymal fistula. *Trans. Am. Oph. Soc.*, 1874, 209, 210.

(sometimes spontaneously, sometimes on pressure), a small drop of transparent fluid.

I am able to add another case to the limited number described in literature.

A short time ago I was consulted by C. H. S., a gentleman aged thirty-five, who complained of no ocular symptoms except some indicative of accommodative asthenopia. While examining him for glasses, he called my attention to a couple of minute and faintly marked puckerings in the palpebral skin, and furnished me with the following history: When eighteen years of age (1876) he was studying law, and working very hard day and night. His eyes then became very weak, and, among other troubles, he noticed that tears remained in the inner corners of his eyes, especially of his left eye. He consulted Dr. Williams, of Cincinnati, who carefully examined the eyes, and discovered an abnormal opening into either tear sac. Under treatment by syringing out the sacs, probing, the use of glasses, and better care of the eyes, the lachrymation almost entirely ceased, returning only on driving in the wind, or on exposure during cold weather. This symptom has persisted to the present day, but is noticeable only when the patient overworks and does not get sufficient sleep. It is also liable to recur whilst driving against a cold wind.

A careful examination of the patient's eyes revealed a minute cicatricial point at the inferior edge of either lachrymal sac. On the right side it is slightly lower than on the left, but is in both situated about the same distance from the nose. A line drawn from the caruncle on each side to the central point of the corresponding upper lateral nasal cartilage, passes through this small mass of puckered scar tissue. The latter is distant from the caruncle about five *mm* on the left side, and about six *mm* on the right. I was able to pass a No. 1 Bowman's probe through a minute opening in the centre of the small scar into either sac. All the puncta and their canaliculi are quite pervious, and I satisfied myself that I could not squeeze any mucus out of either the normal or abnormal openings. As far as I could learn from the patient, he had not noticed any discharge from the unnatural openings: his trouble was mostly a true epiphora. There was absolutely no history from the patient's mother or himself of any inflammation, soreness, "boils," etc., about the eyes, shortly after birth or subsequently, diligent inquiry relative to these

matters having been made at the time of the discovery, by Dr. Williams, of the fistulæ. Patient has hay fever, and was operated upon some years ago by Dr. Holbrook Curtis for its relief. I am inclined to attribute his occasional epiphora partly to the irritation set up by the nasal disease.

NOTE TO THE ARTICLE "REFRACTIVE VALUE OF ANY TWO CYLINDERS," ETC., IN THE OCTOBER NUMBER, 1893, OF THESE ARCHIVES.

By C. WEILAND, M.D., of Philadelphia.

IN the above paper I made the remark that not much had been written upon the subject, adding, however, "as far as known to the author." Since that time, however, I learnt, mainly through the kindness of Dr. *E. Jackson* of Philadelphia, that several papers had already appeared upon the subject and I now beg leave to add a few remarks about the history of this problem.

Ever since *Sturm* in 1845 published his theory of refraction by asymmetrical surfaces (*Comptes rendus de l'Académie des Sciences de Paris*, t. xx., pp. 554, 761, 1238), it was easy to understand why the refraction by two cylinders should give two focal lines, but a detailed calculation for two cylinders was probably first tried in 1849 by *Stokes*, who solved the problem at least for the lens that bears his name, though he only gives the formula and not the demonstration, so that it is impossible to know whether he found a complete solution of the general problem. *Donders* then followed with his acute investigation about astigmatism, and gave in 1864, in his "Anomalies of," etc., a complete solution of the question about the equivalence of any two cylinders, after a consultation with his friends, Professors *Hoek* and *Buys Ballot*. This contribution does not seem to have become known much, probably on account of his not giving all the full details with regard to the dif-

ferent steps in the mathematical process. Later, in 1873, Dr. *Hoorweg*, in *Graefe's Arch.*, vol. xix., published a paper entitled "Versuch einer elementaren Theorie der Cylinderlinsen," in which he attacks the problem quite differently from Donders and gives a complete solution for the Stokes lens. The general problem, however, of any two cylinders is not solved here, though the solution may be found by his method, which is elementary but very exact, in as far as it follows the homocentric rays of light through the two different refracting media successively. In quite a different way Dr. *E. Jackson* of Philadelphia solved the problem at the meeting of the American Ophthalmological Society in 1886, where he gave first a complete and practical solution of the general problem, and stated his last result in a form very similar to that given by me, though at that time I did not know of Dr. Jackson's paper and though my demonstration is entirely different from his. Immediately after the reading of this paper Dr. *G. Hay* of Boston gave a demonstration which he had worked out some years before with Prof. *Oliver* of Cornell University. It is quite similar to that given by Dr. Jackson, but the solution is more indicated than worked out, except for the Stokes lens, where it is complete. In 1888 *Prentice* published his elaborate treatise on combined cylindrical lenses, in which he also solved the problem in an elementary but rather circumstantial manner. These are the authors who have given a solution of the cylinder problem before the publication of my paper and whom I feel it a duty to mention, although no priority was claimed by me except for Donders. All perhaps that may be claimed for my paper is that it contains the most *elegant* method of demonstration thus far given for this problem, and that it describes a practical instrument by means of which an accurate result can be obtained in a few minutes.

THE EXTERNAL USE OF QUININE IN BLENNORRHOIC OPHTHALMIA.

By Dr. GEO. REICH-HOLLENDER, Seattle, Wash.

DURING the last year some eight cases of gonorrhœal ophthalmia and ophthalmia neonatorum came under my observation. I adhered strictly to the established rules: ice compresses renewed every minute or two; argent. nitric. 2, 4, or 6 per cent. applied by the physician directly; saturated boric acid solution every hour; and yet the danger in these and my former cases was baffling at the best. In Vienna hospitals I believe permanganate of potash in a very weak solution (¼ per cent.) is used, but in my hands it has found no favor. Some years ago, while practising general medicine, through a mistake of the druggist in labelling medicines prescribed, I came to use a quinine solution as an injection against gonorrhœa, and with such good results, that I employed quinine afterwards locally in all cases of gonorrhœa.

One of my cases of gonorrhœal ophthalmia being especially troublesome, I concluded to use a quinine lotion as an eye-wash every hour, and did it with the happiest results.

The ice compresses, to overcome the tendency and the mechanical results of the inflammatory swelling, certainly were strictly adhered to, also the argent. nitric. solution as applied directly in the ordinary manner by an oculist.

I found, that after the second day of using the quinine solution or after the third day, the discharge became innocuous, and, within two weeks, not a vestige of the inflammation remained, nor ill effects.

The gonococcus Neisser is destroyed by a solution of quinine, as I have satisfied myself in making cultures.

The best way to exhibit quinine is in a solution partially dissolved by muriatic acid. To use the quinine by insufflation or inspersion in powder seems too severe. In one of my latest cases, where especially the caruncula and lower lid were more œdematous than usual, I used insufflation of quinine at the same time in the nostril of the same side, and I think I would from this on always use this, especially where the region of the lachrymal sac shows a reddish color.

I believe the solution of quinine, either completely or partially dissolved, to be a specific in the ravages of the gonococcus, either in gonorrhœal ophthalmia or ophthalmia neonatorum. I hope that this move on my part may lead to more extensive investigations in general hospitals, where such cases are more numerous.

The following cases will show the mode and effect of the treatment:

Mr. Frank ——, thirty-five years of age, came to me both eyes affected with gonorrhœal ophthalmia of about forty-eight hours' duration. Suffers also with gonorrhœa. The right eye shows a dimness in the inner lower corner of the cornea, discharge excessively purulent. Ordered ice-cloths every minute or two, night and day; treated lids of both eyes with 4 per cent. solution of argentum nitricum, and also ordered saturated solution of boric acid every hour. On the third day, perforation of cornea of right eye imminent. Prescribed atropine every four hours; discharge very profuse but somewhat lessened. I now prescribed, the conjunctiva bulbi being very œdematous:

Quiniæ sulph.	2.
Acid. muriat. dil.	0.75
Aquæ dest.	180.

℥ ft. sol.

SIG.—Shake well and use as an eye-wash every hour.

The next day the cornea had become perforated, and a slight hernia iridis showed itself. Used pilocarpine solution 1½ per cent. every two hours. The purulent discharge had changed; œdema both of lids and conjunctiva lessened; continued ice, argent. nitr., and quinine solution as before. Within three days, dis-

charge non-purulent, œdema greatly relieved, the ulcer in cornea healing, and hernia of iris greatly lessened in size.

Pilocarpine seems to me even more than eserine to reduce the tension of the eye, besides being better borne by the patient. I believe it to open up Schlemm's canal, and in this way to favor the lymph circulation in the eye better than any other remedy. It is milder in its action than eserine and therefore preferable ; I have also used it alternately with atropine, if there be danger from adhesions of iris, or ciliary neuralgic pains prevailing. The patient recovered completely in three weeks, and all that remains is a small pigmented scar on the inner corner of the cornea of right eye, where the perforation had taken place ; no anterior adhesions of the iris.

A baby, four days old, brought to my office with ophthalmia neonatorum. Excessive purulent discharge, œdema of lids, etc.,—in fact, a case of an exceedingly virulent type.

Ordered ice compresses, quinine mixture as eye-water, and used 4 per cent. argent. nitric. Treatment, daily. In three days the purulent discharge disappeared, and within five days the discharge became innocuous, but an excessive hypertrophy of the follicles in upper lids remained. Used Dr. Knapp's invaluable roller forceps, and treated with cuprum sulphuric. Complete recovery in two weeks.

Mr. Thomas ——, a laborer, came to my office ; gonorrhœal ophthalmia of right eye. Heavy purulent discharge, ecchymosis pericornealis, excessive œdema of lids. The other eye also slightly affected, but never became troublesome after quinine solution was instilled. The left eye I did not treat with anything else, so as to prove to myself what the quinine lotion would do in incipient cases. The right eye : ice compresses, argent. nitric. and quinine-mixture eye-water (1 per cent.). On the inner lower corner of the right eye a slight haziness, which cleared up without difficulty. Patient discharged in three weeks completely cured. In this case as the patient was suffering yet with gonorrhœa I gave him a 1 per cent mixture of quinine in suspension (without acid) as an injection, which overcame the gonorrhœa also.

Mr. H——, with gonorrhœal opthalmia, consulted me. Ordered ice compresses, treatment with argent. nitric. 4 per cent. In this case I prescribed, in accordance to a suggestion made to me by a Vienna oculist, a weak solution of permangan. of potash (a solution of a very light claret color). I found no benefit from it that

equalled the quinine mixture, and so after two days' use of the former, I used the latter. Immediately, or at least within an hour, after the commencement of the use of the quinine lotion, the patient felt the relief even from the excessive continuous burning existing previously. As he expressed it to me two hours after, that the eye felt entirely different and 100 per cent. better.

In this case the œdematous condition involved especially the caruncula and lower lid. After the use of the quinine eye-water every hour or two the œdema became lessened, but an intense redness remained in the region of the lachrymal sac, extending toward the nostril of the same side. Assuming the possibility of an infection of the tear duct and left nostril generally, I prescribed insufflation of quinine in powder into the nose three times daily. Atropine prescribed. Two days afterwards the virulence of the disease had abated and patient discharged after a treatment of sixteen days.

The excellent success of quinine, instilled in a partially dissolved mixture, shows in all these cases an excellent result. Ice compresses were never continued constantly over forty-eight hours, and then only occasionally, especially immediately after the heroic treatment of argent. nitric. Pilocarpine, in threatening perforation of the cornea either alone or intermediate with atropine if adhesions were imminent, was all that appeared necessary. In the last stages of the disease, if a follicular conjunctivitis began to supervene, the thorough instrumental application of the roller forceps and cuprum sulfuricum in crystals brought always such cases to a quick and favorable termination. The roller forceps, especially, I almost always found necessary after the twelfth or fourteenth day, or after the discharge became totally innocuous.

INJURY TO THE EYES FROM A HEAVY CHARGE OF ELECTRICITY.

By E. C. RIVERS, M.D., Denver, Colo.

Hugh Ellis, aged twenty-five, was employed by the Denver Tramway Company, as an engineer in the power-house of the electric-car line. On August 24th he had occasion to examine some portion of the machinery, employing for this purpose a wrench. As the wrench, held in his right hand, was approached to the machinery, his elbow accidentally came in contact with another machine, forming a short circuit. The whole electrical force used to propel the cars on several miles of the line, amounting to 550 volts—1000 ampères,—jumped to the wrench and passed down the forearm and out at the elbow. The wrench was held in such a manner as to bring it opposite to and on a level with the face. The discharge of the electricity to the wrench was accompanied by a very loud report, and an intense flash of light, described by the patient as the "brightest thing he ever saw." The patient was knocked down, but if there was any loss of consciousness, it was only for a few seconds, as he arose, and, on account of the severe pain in his arms and face, started to run about in an aimless way, his fellow-employees being obliged to restrain him by force. His face was bathed with water as soon as possible, and he opened his eyes, but found he could only see the position of the doors and windows and objects passing between them and himself.

I first saw the patient about one hour after the accident. The skin on the face, neck, and hands—all the surfaces that were uncovered—was badly burned, looking exactly like a burn from boiling water—the right side being more severely affected, especially the tendons of the right wrist, where the current most likely left the wrench to enter the arm. The eyelashes and eye-

brows were nearly entirely burned off. The skin of the eyelids was blistered, but much less so than the rest of the face.

On pulling the lids apart, the ocular conjunctiva had the appearance as if it had been painted with a strong solution of nitrate of silver. The cornea in each eye was of the appearance of ground glass, the opaqueness being greatest at the centre, thinnest at the periphery, where a very indistinct view of the irides could be obtained—not sufficient, however, to tell their color, which proved afterwards to be a dark-brown. Vision = perception of light. My impression was that the corneæ were destroyed. The attending physician administered a hypodermic injection of morphine, and dressed the burned surfaces. The treatment of the eyes was directed to prevent, if possible, an infection of the corneæ. The attendants were instructed to allow nothing to come in contact with the eye that had not been rendered aseptic by heat,—under no circumstances, any of the dressing from the rest of the face or hands. The eyes were washed out thoroughly and very frequently with water that had just been boiled, and was still as hot as the patient could bear it. A few drops of pure castor oil were instilled after each washing. Four times a day a solution of atropiæ sulph., grs. ij to the ounce of bichloride solution 1 : 5000 were used. The eyes were kept constantly covered by aseptic dry cloths, which it was thought best to frequently change. The eyes progressed well. No considerable pain. The scratching sensation was always quickly relieved by the washing out and the oil. On the second day the opaque portion of the corneæ had begun to separate from the deeper structures, and by the end of the third day the eschar had been thrown off entirely in one eye, and in the other was attached to one point only, at the outer corneal margin, which soon broke. The opaque portion came away *en masse*, leaving behind a perfectly clear structure in each eye, and proving that what I had at first thought was a destruction of the corneæ proper, was simply a destruction of the epithelial portions.

That night the patient was taken with very violent delirium, most likely caused by absorption of deleterious material from his burns. As the atropia might have some influence on his delirium it was stopped and not again resumed. The delirium lasted several days, requiring the constant presence of three of his fellow-workmen to control him.

On September 4th he was able for the first time to come to the

office for a more thorough examination than could be made at home. Well marked photophobia still existed, although the conjunctiva had regained its normal appearance and there was not the slightest opacity in either cornea, even when examined by oblique illumination or the ophthalmoscope.

Vision in right eye $\frac{20}{200}$; left eye $\frac{20}{40}$. Not improved by lenses.

The patient would have to look intently at the letters for a second or two before he could see them well enough to tell what they were. This was true even of the largest letters at the top of the card. The longer he looked at them the brighter they became.

The ophthalmoscope showed the dioptric media perfectly clear. The optic discs and retinal vessels looked normal. The retina, more especially in the right eye, slightly hazy, but I must confess I only came to this conclusion at a later examination when the choroidal vessels seemed to me undoubtedly to be more clearly defined. The visual fields were normal not only for white but for colors also. On account of the photophobia, a solution of pilocarpine, gr. ss. to the ounce, was prescribed.

The patient was last seen three days later—September 7th. He states that in the mornings, he can now see to read the fine print in the newspapers for five minutes at a time before the letters blur out. In the afternoons he cannot see one letter from another.

Vision = right eye $\frac{20}{40}$; left eye $\frac{20}{50}$ —. Lenses refused. He read, with each eye Jäger No. 1 at 6 inches (where he prefers to hold it), but for only a few minutes before it blurs out. Convex glasses before the eyes to correct any remaining effects of the atropia, or any defects of accommodation fail to lengthen the time in which he can read.

The ophthalmoscope shows both eyes of perfectly normal appearances.

The patient felt very much elated over his progress, and I felt perfectly safe in allowing him to carry out his desire of going to the country where his father lived, with the advice to make no attempt to use his eyes, and to protect them from the light as far as possible.

As far as I know, this is the first case to be reported of an injury of this kind. It remains only to be said that I considered the disturbance of vision, which continued after all

outward signs of injury of the eyeballs had disappeared, to be due to the effect upon the retina of the excessively bright light to which it had been exposed, and not to the electrical current *per se*.[1]

[1] March 4, 1894.—Patient presented himself at the office for examination. He says that on his way home he was completely worn out by the journey, and had to stop off at Kansas City, where he was confined to bed for three days. For three weeks following his arrival at home he was obliged to bandage his eyes whenever he went out-of-doors, on account of photophobia. All during the winter the reflection from the snow has been almost unbearable. At the present date I find vision, each eye, $= \frac{20}{10} +$. He can still see plainer at first than after looking a while. The ophthalmoscopic examination is quite painful and produces lachrymation, but reveals no changes in intra-ocular structures. He has given up his old position and is working as a car repairer. Out-of-doors he has to wear smoked glasses.

A NEW PHOROMETER SLIDE.

By WILLIAM E. BAXTER, M.D.,

SURGEON TO THE EASTERN MAINE EYE AND EAR INFIRMARY, OPHTHALMIC AND AURAL SURGEON TO THE BANGOR GENERAL HOSPITAL AND TO THE HOME FOR AGED WOMEN, BANGOR, ME.

(*With a figure.*)

THE frequency with which the strength and the equilibrium of the ocular muscles are tested by oculists, at the present time, requires instruments of precision, and also instruments that will enable us to do the work in the shortest time consistent with accuracy. The prism slide here described will not only enable us to measure the mus-

cular equilibrium with the exactness of the Stevens rotary slide, but will also enable us to measure the strength of the recti muscles with the same instrument and with the same exactness.

The slide consists of two enlarged Risley rotary prisms, placed immovably in the large metal face of the phorometer slide. The left prism—facing the operator—is set with the zero mark vertical and registers from 0 to 30°. By turn-

ing the rotating screw and revolving the apex of the prism to the left, an abducting prism is formed, and is indicated by the letters ABD placed above and to the left of the prism; by revolving the apex to the right, an abducting prism is formed, and is indicated by the letters ADD placed above and to the right of the prism.

The right prism is set with the zero mark horizontal and registers from 0 to 10°, and by revolving the apex of the prism upward, a left sursumducting prism is formed, and is indicated by the letters L SUR placed above and to the right of the prism; by revolving the apex of the prism downwards, a right sursumducting prism is formed, and is indicated by the letters R SUR placed below and to the right of the prism.

By producing a vertical diplopia by overcoming sursumduction with the right prism, any deviations are measured by revolving the apex of the left prism to the right or left, and the heterophoria is indicated by the letters EX placed under the ABD, and by ES placed under the ADD.

By producing a horizontal diplopia by overcoming abduction by the left prism, any deviations are measured by revolving the apex of the right prism upwards or downwards, and the heterophoria is indicated by the letters LH placed under the L SUR, and by RH placed under the R SUR.

In measuring the strength of the ocular muscles it is well to place the slide as near the eyes as convenient, as by removing the prisms from before the eyes the individual strength of the muscles is diminished, but the relative strength is not affected. This slide is made by Meyrowitz, New York.

ON TESTS OF THE LIGHT SENSE OF THE PERIPHERY OF THE RETINA FOR DIAGNOSTIC PURPOSES.

By Dr. WARD A. HOLDEN.

GROENOUW of Breslau has recently proposed[1] a method of testing the visual acuteness of the periphery of the retina by means of a perimeter, in which the test-objects employed consist of a series of different-sized black points on a white ground. The result thus obtained is termed by him the visual acuteness for a point. By employing quite small points which are not recognized in the extreme periphery of the field, the function of the intermediate and central zones of the retina may be examined, the test being of such delicacy that it often furnishes more information than even perimetric tests with colors. A routine use of this test has convinced me of its value in diagnosis and prognosis in cases where the results of ordinary perimetric examinations are inconclusive.

Experiments have shown me, however, that altogether similar results are obtained by employing gray patches of different intensity on a white ground, these having some advantages over black points, and the test being one which may conveniently be used as a check on the other. But the test with patches of this sort is a test of the light sense purely, and it would seem that the determination of the visual acuteness for a point is also simply a determination of the light sense, although Groenouw does not positively so regard it.

[1] These Archives, xxii., 4.

In the following pages it is proposed to give a brief summary of our knowledge of the light sense of the periphery of the retina, and to indicate some of the cases in which the tests have proved of service.

There was formerly much discussion as to whether the light sense of the periphery of the normal retina is nearly or quite equal to that of the centre, or whether on the contrary there is a progressive diminution in the light sense as we pass from the macula toward the ora serrata. This discrepancy of opinion may be explained by the fact that those who found a diminution in the periphery made their experiments with the illumination of ordinary daylight, having test-objects of varying luminous intensity; while those who found the light sense of the periphery nearly equal to or greater than that of the centre, experimented with varying degrees of decreased general illumination with a constant test-object. The normal adaptation of the retina to differences of general illumination was not taken sufficiently into account, and therefore the results obtained by equally careful experimenters seemed to be diametrically opposed.

The experimenters of the latter category used the photometer of Förster or some modification of it. This instrument is a closed box in which is a test-object, at which the observer looks, while by means of an adjustable diaphragm light is admitted to the box in increasing quantity until the observer can just recognize the test-object. This gives the minimum objective light stimulus that can be perceived (threshold excitation, *Reizschwelle*, of Fechner). When the observer remains a quarter of an hour in a dark room before the experiment is made, the test-object is recognized under much weaker illumination than if the experiment is made directly after coming from a light room, the eye in the former case undergoing an adaptation to the new illumination. Experiments made in this way seemed to show that the retina was everywhere equally sensitive to light except in the extreme periphery; and when the period of adaptation was shortened, the periphery was found to be more sensitive than the centre.

The experimenters of the first category used mostly Masson's disc or some modification of it. This is a black disc rotated by clockwork and having a white object placed upon it somewhere near its periphery. When the disc is rotated the white object produces on the black ground a gray ring, which is lighter or darker, according to the diameter of the object. The width of the white object is now reduced until the gray ring is just distinguishable on the black ground. Then from the angle subtended by the white object and the difference in luminous intensity between the white and the black, the difference in intensity between the gray ring and the black ground may be computed, and thus one obtains the minimum difference that can be perceived between two intensities of light stimulus (difference threshold, *Unterschiedsschwelle*). Experiments made in this way in ordinary daylight showed that *the sensitiveness to light stimulus diminishes gradually from the centre of the retina to the periphery.* When the illumination was decreased it was found that even with the Masson disc the central sensitiveness to light became relatively less acute, the results of the experiments being similar to those obtained by using the photometer.

It was found further that the illumination might be lessened considerably before the central acuteness of vision was reduced. And similarly, Ole Bull found that the field for a white object on a black ground was not greater than for a dark gray object of the same size on a black ground, but that when the gray was made considerably lighter the field in which it was recognized was gradually reduced.

These latter facts seemed to show that there were limits to the application of Fechner's law that within a large range the smallest perceptible differences of light intensity correspond to a constant fraction of one of the intensities compared; for example, that if with medium intensities a difference of $\frac{1}{60}$ can be recognized, a difference of $\frac{1}{60}$ should still be recognized when the two intensities are very weak or very strong—just as Weber believed the smallest appreciable difference in sound, weight, and distance to be always a constant fraction of one of the values employed. It ap-

peared, however, in the cases where Fechner's law did not hold good that the physiological adaptation of the retina had not been taken sufficiently into account, and it was found that if the eye was allowed to exercise its full measure of adaptation, Fechner's law held good within very wide limits (Schirmer).

The phenomena of adaptation may be briefly stated as follows: When a person passes from ordinary daylight into a darkened room, at first his central acuteness of vision decreases very much, his field of vision contracts, the color fields also, and instead of the usual relation being preserved where the field for blue is widest, for red next, and for green the narrowest, the order is reversed, the field for blue being narrowest, for red next, and for green the widest. After remaining in the darkened room a few minutes, the color fields regain their normal relation, the field of vision becomes larger, and the central acuteness of vision improves in a measure. In the course of twenty minutes the central vision increases greatly, being, according to Aubert, thirty-five times more acute than when the room was entered. After twenty minutes there is but little additional adaptation in the next two hours.

The process of adaptation may be most simply explained as being a restoration of the retina after fatigue. After the irritation from exposure to the bright light of day, slight differences between very weak intensities of light are not recognized, but when the retina is allowed to recover from the excessive stimulation, it becomes sensitive to extremely weak stimuli. The central portion of the retina is more quickly fatigued than the periphery, and is also more slowly restored, and with decreased illumination the acuteness of vision suffers relatively more in the centre than in the periphery, and adaptation in the centre requires a longer time for its completion. Adaptation depends chiefly upon processes which have their origin in the pigment epithelium.

Thus far, we have considered the conditions in the normal eye, but these conditions may be disturbed in various ways in different pathological states.

Förster examined cases of hemeralopia with his photo-

meter and found that, in order to perceive the test-objects, a more intense illumination was required by the hemeralopic eye than by the normal one, showing that there was a reduction in the light sense in respect to the minimum intensity that could be perceived.

Bjerrum examined a number of cases of amblyopia, both with the photometer and with Masson's disc, and found that in some cases the central perception of minimum intensity was much reduced (photometer test), while the power of distinguishing minimum differences of intensity under a constant illumination was but slightly reduced (Masson's disc test), and *vice versa*.

In the cases where the excitation threshold was more affected than the difference excitation, the choroid or retina was found to be diseased, while in the cases where the difference threshold was affected more than the excitation threshold the optic nerve was found to be diseased. Wolffberg found that the ability to distinguish colors varies with the same conditions as does the light sense, and that the determination of one may in a measure take the place of the determination of the other. He found cases of eccentric anomalies of the light sense in which, with slightly decreased illumination, the color fields were contracted disproportionately to the field for white, and in a reverse order, the field for blue being smallest. These were cases having changes in the pigment epithelium. In other cases there were eccentric anomalies of the light sense, with contraction of the color fields in their normal order. These were optic-nerve diseases and glaucoma.

Treitel examined cases of hemeralopia and came to the conclusion that idiopathic hemeralopia is not a diminution of the light sense proper (the power of distinguishing between minimum differences of intensity), but a fault of adaptation. If an individual with normal eyes and one with hemeralopia enter a darkened room, there takes place with each a diminution of acuteness of vision, color sense, and light sense; but after twenty minutes this diminution has greatly increased in the normal eye while scarcely at all in the hemeralopic eye. Hemeralopia may be due to a slow-

ness of adaptation and not to a want of it; thus one of Treitel's patients with marked hemeralopia showed normal conditions in the dark room after his eye had been bandaged thirty-three hours. Later observers have confirmed this opinion.

In the normal eye and in amblyopia from optic-nerve disease, the acuteness of vision, color sense, and light sense are much reduced when the illumination is first reduced, but they soon increase again. In chorio-retinal diseases this secondary increase is much less. Abnormal adaptation or hemeralopia may be recognized by testing the light sense or color sense immediately after the illumination has been diminished, and again after twenty minutes.

This explanation of hemeralopia has anatomical support. Clinically we find hemeralopia with choroiditis and chorio-retinitis. We know that the pigment epithelium and all the outer layers of the retina are supplied by the choroidal vessels. In retinitis pigmentosa, the disease causing the most marked hemeralopia, the pigment epithelium is particularly affected and it seems probable that the sclerotic changes found in the choroidal vessels may be the primary lesion.

Every case of acquired amblyopia, whether from cloudiness of the media, diseases of the fundus, or affections of the optic nerve, shows for the central portion of the retina a diminished perception of minimum differences of luminous intensity, and most of these cases also show light-sense anomalies in the peripheric zones of the retina. In ordinary daylight the light sense of the retina gradually diminishes from the centre to the periphery. The gray-patch and black-point tests reveal deficiencies in the perception of minimum differences of luminous intensity. By using large black points and dark-gray patches slight light-sense disturbances in the periphery of the retina may be discovered; while small black points and light-gray patches will reveal slight light-sense anomalies in the intermediate and central zones.

The black point that is just recognized by a particular portion of the retina gives us the *smallest area* of black that can be distinguished from the white ground; the gray patch

that is just recognized gives us the *weakest intensity* of black of large area that can be distinguished from the white ground. With a given illumination the two tests seem to give altogether similar results, and apparently both are tests of the light sense purely.

The use of the tests in practice.—In order not to complicate the tests unnecessarily, I have found it sufficient to use two test-cards only. One card has a 1 *mm* black point on one side and a 15 *mm* quadrant of light gray, having $\frac{1}{8}$ the intensity of white, on the other. With a perimeter of 30 *cm* radius the black point and the gray patch are each seen by my own eye inward 35°, upward 30°, outward 45°, downward 35°.

The second card has a 3 *mm* black point on one side, and a darker gray patch having $\frac{1}{8}$ the intensity of white on the other, each of which are seen inward 55°, upward 45°, outward 70°, downward 55°. The intensities equivalent to the points were determined empirically, and their relation to white Bristol board afterwards found by photometric methods.

In routine work it is sufficient for the surgeon to stand 60 *cm* from the patient, having the patient fix his finger held half-way between them, and then move the test-card in from the periphery in a median plane half way between them, until the black point is recognized. If the patient's eye is normal he should recognize the black point as soon as the surgeon recognizes the gray patch on the other side of the card. When the object is said to be recognized the card may be turned so that the patient sees the other side, when the patch should be equally well seen. With uncorrected refractive errors the patch may be seen farther than the point, but by using both, discrepancies in the patient's answers may be made out and fairly accurate results obtained.

In practice a 5 *mm* white quadrant on black should first be used to detect absolute defects and marked disturbances of light sense. After this Card 2 will reveal slight disturbances near the periphery. Then Card 1 may be used to detect slight changes in the intermediate and central zones.

A 0.5 *mm* print is sometimes useful in detecting very slight changes in the centre.

A few cases will show the usefulness of the tests. The following are mostly from Dr. Knapp's private practice, to whom I am indebted for permission to use them.

1. A woman of twenty-five complained of blurred sight. V = $\frac{20}{40}$, field for white normal. Interior normal. Test Card 1 revealed a defect in the upper portion of the field extending to a point 20° from the fixation point. Some time later V = $\frac{6}{200}$, the field for white was much contracted in all directions, the optic disc was pale.

2. A man of forty-five complained of failing sight. R. V = $\frac{20}{40}$. There was a history of the excessive use of tobacco. Temporal half of the optic disc slightly pale. Field for white normal, for Card 1 a large central scotoma.

3. A woman of forty-five, with absolute glaucoma in right eye, complained of asthenopia. L. V = $\frac{20}{40}$. Field for white normal. Slight partial cupping of the disc. Tension normal or slightly increased. Card 1 showed a marked contraction of the nasal half of the field.

4. A man of twenty-eight, with a history of syphilis, noticed an occasional blur in the right eye. V = $\frac{20}{20}$—. Field for white normal. There is a slight diffuse haziness of the retina and some changes in the vessels. In the temporal half of the field there is a large scotoma for Test Card 1; in the nasal half is a smaller scotoma in which even Card 2 is not seen.

5. A girl of sixteen, with albuminuria and failing sight for six months, had V = $\frac{7}{200}$, and field for white normal. There were a few characteristic changes in the retina. With Card 1 a scotoma was found, including the fixation point and occupying a large portion of the temporal field.

6. A boy of nineteen, with a recent partial hemiplegia and partial paralysis of both third nerves, had R. V = $\frac{20}{60}$, L. V = $\frac{20}{40}$, with very slight contraction of each temporal field for white and normal fundus. With the test-cards a complete temporal hemianopsia was found reaching to the fixation point in each eye.

7. A man of fifty had noticed failure of sight for eight months. R. V = $\frac{20}{100}$, L. V = $\frac{20}{40}$, optic discs slightly pale. Field for white normal. For both test-cards a complete temporal hemianopsia was found in each eye.

In most of these cases color-tests revealed defects almost as extensive as those found with the card-tests, for there cannot be much disturbance of the light sense without interference with the perception of at least green and red. It is, however, very much easier for the ordinary individual to say when an object comes into view and when it disappears, than to say when the color of a test-object is distinctly recognized.

A few words in regard to perimetry with colors may not be out of place here. The extent of the fields for colors varies with the hue, with the saturation, with the intensity, with the size, and with the contrast in luminous intensity between the colored patch and the background.

The most suitable colors are saturated ones, and such as do not pass through a series of hues before disappearing in the periphery, a pure green for example, becoming successively yellow-green and yellow before the color is completely lost. This change in hue may be mostly prevented by adding a little blue to the green. (O. Bull, Hegg.)

Other conditions being the same, the field becomes larger as the saturation, the intensity, or the size of the color is increased; and the field is larger, the less the contrast in luminous intensity between test-object and background.

Thus bright colors have a larger field on a white ground than on black, and dark colors a larger field on black. In theory the best background is a neutral tint which has the same luminous intensity as the color. This gives the largest field, and when the object is carried so far into the periphery that the color is lost, the colored patch itself disappears entirely, since it has the same brightness as the ground. The recognition of the patch means the recognition of the color. In practice I have not found such a background of very great advantage, for the reason that the luminous intensity of different colors varies in different degree with changes of general illumination. A gray background having exactly the luminous intensity of the colored patch under diffuse daylight in the morning will not be equivalent to the color in the afternoon, and the difference in artificial light and in daylight is very great. A gray background carefully selected

one day to be exactly equivalent to a given red for my own eye, the patch being invisible in the periphery beyond the point where the color was lost, was tried the following day with a patient having a central scotoma for red. The patient recognized the red patch at once as being brighter than the ground.

Even with the most favorable conditions of color and background, the answers of the patient in many instances are unreliable and confusing. With the black-point and gray-patch tests the information obtained is much more definite. And since color perception in patients not congenitally color-blind varies with and may be considered a function of the light sense, these tests may be used as a check on perimetric color tests or even in many cases replace them altogether.

ASTIGMATISM AND THE OPHTHALMOMETER.

By FRANK VAN FLEET, M.D., New York City.

SINCE the introduction of the ophthalmometer many statements of its accuracy or want of accuracy have been made pro and con. Some by gentlemen who showed by their statements how little they knew of the subject they discussed, but others, and I think the majority, testifying to its value and efficiency.

With the idea of seeing how far my own experience would agree with the views of others, I have taken one hundred cases as they came, and have tabulated them as follows:

Of these 100 patients,

5 had no astigmatism.
85 had astigmatism with the rule in both eyes.
1 had astigmatism against the rule in both eyes.
5 had astigmatism with the rule in one eye and against the rule in the other.
2 had astigmatism with the rule in one eye and no astigmatism in the other.
2 had astigmatism against the rule in one eye and no astigmatism in the other.

100

There were 200 eyes.

177 had astigmatism with the rule.
9 had astigmatism against the rule.
14 had no astigmatism.

200

[1] Read before the New York Academy of Medicine, Section in Ophthalmology, December 18, 1893.

In astigmatism with the rule,

5	accepted	the full amount of correction.
28	"	0.25 D. less.
84	"	0.50 D. "
23	"	0.75 D. "
23	"	1.00 D. "
1	"	1.25 D. "
5	"	1.50 D. "
3	"	1.75 D. "
3	"	2.50 D. "
2	"	3.00 D. "
177		

One accepted a cylinder against the rule which was reversed under atropine.

None accepted more than the amount given by the ophthalmometer.

Where astigmatism existed against the rule,

1	accepted	0.25 D. less than the full amount.
1	"	0.75 D. " " " " "
1	"	0.25 D. more " " " "
1	"	0.50 D. " " " " "
5	"	exact amount given.

Where no corneal astigmatism existed,

7	accepted	no cylinder.
3	"	0.25 D. against the rule.
3	"	0.50 D. " " "
1	"	a cylinder with the rule reversed under atropine.

In astigmatism with the rule, 1 accepted the cylinder at 90° when it should have been at 105°. The use of atropia might have altered the axis in this case, but, as I considered the difference of trivial importance, it was not used. Of the eyes that accepted more than 1. D. less than the amount given by the ophthalmometer, 1, No. 12 in the list, the right accepted 1.25 D. less than the corneal astigmatism. Vision was improved to $\frac{20}{30}$. The refractive condition was myopic astigmatism, and patient had had iritis. He was twenty-seven years old.

5 accepted 1.50 D. less.

Case 32.—Twenty-nine years old. Left eye had hyperopic astigmatism. Accepted +1.50 D. c. Vision was not improved.

Case 35.—Nine years old. Right eye, hyperopic astigmatism 3. D. Accepted + 1.50 D. c. Vision $\frac{20}{200}$, improved to $\frac{20}{40}$. There was slight convergence.

Case 64.—Fifteen years old. Both eyes had 3. D. hyperopic astigmatism. Axes 120 in one eye, 60 in the other. Vision $\frac{20}{100}$ and $\frac{20}{70}$, improved to $\frac{20}{40}$.

Case 68.—Thirty-two years old. Right eye, compound myopic astigmatism 3. D. Accepted — 1.50 D. c. Vision $\frac{20}{70}$, improved to $\frac{20}{30}$.

Three accepted 1.75 D. less.

Case 49.—Thirty years old. Right eye, hyperopic astigmatism 3. D. Accepted + 1.25 D. c. Vision $\frac{20}{200}$, improved to $\frac{20}{50}$.

Case 63.—Twenty years old. Right eye, compound myopic astigmatism 1.75 D. Vision $\frac{20}{200}$, not improved.

Case 68.—Thirty-two years old. Left eye, compound myopic astigmatism 3.50 D. Accepted — 2. D. s. and — 1.75 D. c. Vision $\frac{20}{100}$, improved to $\frac{20}{30}$.

Three accepted 2.50 D. less.

Case 23.—Twenty-five years old. Left eye, compound hyperopic astigmatism 4.50 D. Accepts + 5.50 D. s. and + 2 D. c. Vision $\frac{20}{30}$, not improved. Had been wearing 4. D. s. only.

Case 91.—Seventeen years old. Both eyes myopic astigmatism 3 D. Right, astigmatism with the rule, axes 65 + or 155 —. Vision $\frac{20}{70}$, accepts — 0.50 D. c. ax. 65. Under atropia, accepts — 2.50 D. c. ax. 155. Left eye, astigmatism with the rule, axes 125 + or 35 —. Vision $\frac{20}{70}$, accepts — 0.50 D. c. ax. 125. Under atropia, accepts — 2. D. c. ax. 35. Right eye accepts 0.50. D. less than the full error; left eye, 1. D. less.

The curious feature of this is that the patient did not accept a — spherical as well as a — cyl. against the rule. He did not, however, and the only explanation I can give is that, owing to the great irregularity of his muscular effort, he was uncertain about what he did accept.

Both improved to $\frac{20}{30}$.

Two accepted 3. D. less.

Case 65.—Thirty years old. Both eyes, mixed astigmatism. R E 6. D., accepts + 2. D. c. ax. 90 and — 1. D. c. ax. 180.

Vision $\frac{20}{70}$, improved to $\frac{20}{30}$. L E 5. D., accepts + 1. D. c. ax. 95 and — 1. D. c. ax. 5.

Atropia was used only when there was a great discrepancy between the ophthalmometer and the patient's acceptance,—as when the instrument indicated a corneal astigmatism with the rule, and the cylinder was accepted against the rule. When a difference existed of from 5 to 15 degrees none was used.

In Case 100, where the corneal astigmatism was 1. D., and 0.75 D. c. was accepted, the history says that under atropia 1. D. was accepted. It is possible, therefore, that its use in more cases might have caused the acceptance of stronger cylinders. My idea, however, being to have the eye in its natural condition, it was not used oftener.

This list comprises one hundred cases occurring in my private practice, and is a fair indication of results as I obtain them. One thousand or more would not have altered it.

Dr. Black, of Denver, Colorado, narrates a series of eleven cases where the axes of cylinders accepted were exactly opposite to that indicated by the ophthalmometer, and the deductions drawn are corroborated by Dr. Risley, of Philadelphia, in a large number.

Dr. Black says that in a case of astigmatism with the rule we would expect the patient to accept a plus cylinder at 90°, or a minus cylinder at 180°, but that, as a fact, if we use atropia, we will probably find the acceptance to be directly opposite—that is, a minus cylinder at 90°, or a plus at 180°. This is entirely opposed to the results obtained by those who have had the largest experience with an intelligent handling of the instrument. I have yet to see the case that cannot be made to accept the cylinder in the direction indicated by the ophthalmometer, and yet the doctor goes on to say that he considers the instrument of inestimable value. In the light of his published experience, however, I fail to see how he can so consider it. One would suppose that if it was as apt to be wrong as right, it would be absolutely worthless.

The rules to be observed in the correct manipulation of the ophthalmometer are very simple, and yet we hear of observers who use all sorts of methods to get the best results —methods which it seems to me are entirely unnecessary

and only serve to make it appear more difficult to the beginner.

One gentleman advocates the strapping of the patient's head to the head rest, and placing an object in front, which is to be steadily looked at. This is all unnecessary. If the eye not under observation is covered so as to overcome the necessity for convergence, there is never in any one but a child any trouble in fixing the eye. If the patient looks into the tube directly in front, he will see his own eye, and that will be all that is necessary. It is true that patients frequently keep moving the head away from the forehead rest, and we have to follow them up by pushing the instrument forward, but if we tell them in the beginning what we want them to do, they will do it. With children, the parent can gently press the head from behind, keeping it in position, and the observer, by constantly talking to the child, can keep his little patient looking at the eye in front of him.

The simpler the arrangements, the better. Straps and all extra paraphernalia are more apt to frighten and so complicate matters than otherwise.

The only alteration I would make would be to remove the immense disc, which is not only in the way, but is ugly-looking and a source of terror to many patients. As the instrument is used, it merely serves to mark the axis, which could be as easily accomplished from behind. That the disc has another purpose is true, but it is not put to other uses in this country, as far as I know. In fact, I have never met any one who knew exactly what its other purposes were. I think the older model, such as is pictured in some works on the eye, a much nicer one. I do not, however, speak from experience on this point.

Many of the adverse expressions we hear are due to a lack of familiarity on the one hand, and to imperfect instruments on the other. I have seen instruments in oculists' offices that it would be impossible to get a correct finding with—one, for instance, where the large disc was so marked that the axis of a cylinder, if ordered in accordance with the finding, must, of necessity, be 15° off. This was easily remedied by shifting the disc.

Another, where the stand made of wood was so warped that it rocked like a cradle. This can be overcome by having a metal one, which does not warp.

In another, the bar holding the mires was bent, making it impossible for the mires to line, and so on. These defects are due to poor workmanship or rough handling in transportation, and may occur, I presume, in instruments of home as well as of foreign manufacture. It has been, as far as my observation goes, however, entirely confined to the imported article. We are making ophthalmometers in this country which are not only cheaper than those manufactured abroad, if we count the import duties, but far superior in workmanship.

While on the subject of domestic and foreign manufacture, I should like to say a few words on domestic and foreign use. It seems at first glance strange that in all the clinics in Europe, so little is known of the value of the ophthalmometer. It is to the credit of this country, and this city in particular, that prejudice does not act to such an extent that we refuse to acknowledge a good thing when we see it, simply because some one else invented it, or because it carries us out of the orthodox way. The honor of being the first to use it in this country belongs to some one, no doubt. But the honor of doing the most to disseminate a knowledge of the ophthalmometer belongs to Dr. D. B. St. John Roosa and the New York Post-Graduate Medical School. We have taught men from all over the country, in the classes at our school, the way to use this instrument, and it is probable that but for the demand which has come in consequence of our teaching we would not be making them in this country to-day. It is true that men outside of this city use the ophthalmometer in their private practice, but their assistants at the clinics came to *this city* to be taught how to use it.

In starting out to buy an ophthalmometer it will be best to go to some reliable American Manufacturer who will guarantee his work, and then before beginning observations have it thoroughly tested. To possess an imperfect instrument is worse than having none, and to practise ophthalmology without an ophthalometer is to work at a disadvantage.

We feel justified in saying that with a perfect instrument in the hands of a competent observer the ophthalmometric finding can be relied on.

Having a perfect instrument the next essential is to know how to use it. We all have our own little methods of examining patients, which, while they tend the same way, give us more satisfactory results when we adhere to them. Let me delineate the method I invariably employ in people whom I have every reason to suppose are suffering from accommodative strain.

I first obtain visual acuteness without glasses.

The next step is to seat them before the ophthalmometer. With the chin on the rest, the forehead against the bar, the patient is told to press gently against it, and keep looking easily into the tube. It is well to examine the right eye first, covering the left. If we follow a certain rule in this respect we avoid confusion. Examine this eye and record the result. Then the left.

The patient in position, we seat ourself on the other side of the instrument and adjust the height. This is done by glancing along the notches on the top of the tube, as one does a gun barrel, until the notches coincide with the cornea. We get the focus by moving the tripod backward and forward until the picture shows bright and clear.

It is well now to have the long pointer, which was perpendicular to the bar carrying the mires, at 135°. Turn the tube, causing the long pointer to move from left to right, until the mires line. This gives the primary position. It will never be necessary in regular astigmatism to move the pointer, starting at 135° farther to the right than to 45° to get this position.

Having the first position, move still to the right for the second. This will be 90° from the first, and here the mires will line again. If in the second position the mires overlap, we have astigmatism with the rule, indicating that the meridian of greatest refraction is vertical. If they separate, we have astigmatism against the rule, and the meridian of greatest refraction is horizontal; the long pointer in the first meridian indicating the axis of the minus cylinder when

with the rule, and of the plus when against the rule. Astigmatism with the rule implies that the meridian of greatest refraction is nearer vertical than horizontal; against the rule, the reverse.

The reason for turning the long pointer to the right is this. If the mires meet and line horizontally, and overlap vertically, we have astigmatism with the rule. As long as this is between 45° and 135° it would be the same no matter in which direction the pointer was turned. The axis of the plus cylinder would be nearer the vertical and the minus nearer the horizontal. When, however, the primary position is found at 135° and the secondary at 45° we have the two exactly between vertical and horizontal. In this case it would be impossible to tell how to place the axis except as the patient accepted it. If, however, we adhere to the rule as above stated we cannot be in error. For example, starting at 135° the mires meet and line. Turning the long pointer to the right they line again at 45° and overlap, we have astigmatism with the rule and the axis of the minus cylinder will go where the pointer indicated in the primary position, or at 135°. We have now accomplished in a few minutes and accurately, what would have taken several days with the old method of atropine and even then uncertainly.

Nothing is more tiresome and annoying than the haphazard floundering one must necessarily resort to when trying to find the amount of cylindrical acceptance with the axis, when we depend entirely on the patient's answer. Let any one try himself and he will see how impossible it is to tell the exact amount of acceptance.

Retinoscopy has of course a certain value. But not only may the amount but also the axis be altered by accommodation, so that to prescribe with any accuracy at all it is necessary to resort to atropine. It is not a new idea that dilatation of the pupil and paralysis of accommodation may not only not help us in ascertaining the true amount of refractive error, but actually be a detriment. Mention is made of this fact in Donders, and we are all familiar with the cases that cannot be made to see as well under atropine as they did before.

Having ascertained the amount of astigmatism and the axis the next question is whether we shall correct to within 0.50 D of the total, when with the rule. The statement that an oblique position of the lens may cause astigmatism and so neutralize the corneal error is also mentioned in Donders. We are taught to believe that this exists in all cases, increasing astigmatism against the rule, and diminishing astigmatism with the rule, and that the amount is constant, being 0.50 D. If this is true then we find the treatment very simple. Given a patient with 1. D corneal astigmatism with the rule, allow 0.50 D for lenticular aberration and there is required a plus cylinder 0.50 axis vertical or a minus cylinder axis horizontal. We put a minus cylinder on. If we have to deal with a simple myopic astigmatism the trouble is corrected. If it is one of simple hyperopic astigmatism the eye is converted into a hyperopia of 0.50 D and is normal. If we have already a hyperopia of say 2. D in one direction and 2.50 D in the other, with our minus cylinder we convert the eye into simple hypermetropia of 2.50 D. If this is more than can be borne with comfort, especially if there is failing accommodation, we have only to add a plus spherical to the minus cylinder and the trouble is corrected.

We have here to admit of an exception. We say that in corneal astigmatism with the rule the patient will accept a plus cylinder at 90°, or a minus cylinder at 180°. *Unless* spasm of accommodation exists sufficient to convert with the rule into against the rule.

This is the only theory by which we can explain such a case as No. 60 of my list.

We have already noted that an oblique position of the lens is supposed to be the cause of 0.50 D of astigmatism against the rule in most eyes. If we admit this obliquity we must admit also the possibility of more in some and less in others. There must, however, be a limit. A tilting of the lens sufficient to compensate for 1.50 D, would, for instance, amount almost to subluxation. And again, as proof that it is due to spasm of accommodation is the fact that atropia overcomes it.

This is one of the rare conditions where atropia is advisable. Where spasm of accommodation converts hyperopic astigmatism with the rule into myopic astigmatism with the rule, unless the amount be large, that is over 1.D., the error can be corrected as well with a minus cylinder at 180° as with a plus cylinder at 90° in young people. Either corrects the astigmatism, and if astigmatism is the disturbing factor either will relieve.

Where, however, irregular spasm causes astigmatism with the rule to become against the rule, then atropia is a desirable agent to employ. And here we find a use for the ophthalmometer that is not usually mentioned—namely, an instrument which tells us when to use atropia.

This brings me to a point where I must confess my inability to take a decided stand—that is, whether patients should be made to accept their full correction. Astigmatism and hypermetropia are compensated for in the same way. We give glasses to hyperopes simply to reinforce their ciliary muscles, and the amount of reinforcement required depends on the age and peculiarities of the individual. Many cases occur where astigmatism of considerable amount exists without causing symptoms of asthenopia or even defective vision. I think if we push atropia until complete paralysis occurs we can get most people to accept a glass representing the full amount of either hypermetropia or astigmatism, which they will continue to accept as long as this unnatural condition continues. It is questionable whether it is well to require them to wear such a glass after accommodation returns. My experience is that patients complain of such treatment.

There is no rule which will be an invariable guide to the amount of acceptance in all cases. As my list shows, some accept the full amount of astigmatism, while others vary from 0.25 D. to even 3. D. We will generally find that when the amount exceeds 1. D. we have to deal with myopia or some abnormal condition in the eye, as irregular astigmatism lenticular opacities, detached retina, etc.

I have found frequently that myopes are not benefited by cylinders that correct their corneal error. This to my mind

is not due to secondary astigmatism of the lens, and atropia does not make any difference. My explanation is, that in axial myopia the bulging backward of the posterior portion of the eye causes a retinal astigmatism which complicates the corneal irregularity. I do not think this at all surprising, nor do I consider that it gives a "black eye to ophthalmometry," as has been remarked. Myopia is a pathological condition, and one in which, at best, we do not expect very much.

There are some cases not myopic where the acceptance is much less than the full amount. It may be due to irregular and mixed astigmatism, and sometimes amblyopia from unknown cause. Where it is due to spasm, as I have said before, atropia can be used if it is necessary that the full amount should be accepted. In no case has it occurred that the amount accepted was greater than the amount indicated when with the rule.

This is certainly a very important point, and a guide for treatment. It would be very much more to the patient's disadvantage to over-correct astigmatism with the rule than to under-correct it, inasmuch as over-correction would be equivalent to having astigmatism against the rule, which is said to be the most annoying variety. We may say, therefore, that the ophthalmometer gives us an accurate and a rapid guide to the limit of cylindrical correction to be prescribed in a given case with its axis.

One can hardly fail to see the advantage of this method over the old atropine treatment. The saving of time to the doctor, and of time and money to the patient, are objects to be desired. Accuracy is also better obtained by the newer way.

PARALYSIS OF THE SUPERIOR RECTUS AND ITS BEARING ON THE THEORY OF MUSCULAR INSUFFICIENCY.[1]

By Dr. A. DUANE,

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PARALYSIS of the superior rectus has usually passed for a pretty infrequent affection. Mauthner in his classical work upon *Paralyses of the Ocular Muscles*, states that of 108,000 cases of eye diseases of all sorts, collected by Mooren, there is not a single case of isolated paralysis of the superior rectus recorded, while in Graefe's 40,000 cases there are 9, in Schubert's 20,000 cases 8, and in Schöler's 20,000 cases 3. On the other hand, Hulke out of 19 cases in which the oculomotor nerve was affected found isolated paralysis of the superior rectus in 5. This last result, Mauthner says, is opposed to all our experience, and he adds that one would rather expect to encounter twenty cases of total oculomotor paralysis in succession before meeting with one in which only a single branch of the nerve was affected.

In spite of this dictum from so eminent an authority, I must say that my experience is quite in accord with Hulke's; and, in fact, among the cases that I have examined, isolated paresis of the superior rectus stands next in order to that of the external rectus, surpassing even paralysis of the superior oblique in frequency. I have, that is, in examining a comparatively limited number of unselected cases both in private

[1] Read before the Section of Ophthalmology and Otology at the N. Y. Academy of Medicine, Feb. 19, 1894.

and dispensary practice, seen six in which there was undoubted paresis of the superior rectus unaccompanied by any other form of paralysis, or by any heterophoria not directly attributable to the affection of the superior rectus itself; and I have seen four others in which it was associated respectively with esophoria, insufficiency of the externi, paresis of the internal rectus of the other eye, and a concomitant divergent squint—complications which have obviously no real etiological connection with the condition in question. In addition, I have noted some half dozen other cases in which the muscular conditions were more complex, but in which various circumstances pointed to the part played by the affection of the superior rectus in the production of the attendant symptoms; so that from these and the cases just mentioned, a fairly complete symptomatology can be evolved, together with data regarding the etiology and treatment.

For convenience of inspection I have presented the histories of these cases in the appended tabular form. Before seeking to draw any inferences from them, however, I would like to invite your attention for a few moments to a consideration of the nature and diagnostic features of the condition which we are studying.

The superior rectus is an elevator and adductor of the eye, and rotates the upper extremity of the vertical meridian of the latter inward. Its elevating action is most marked when the eye is abducted; its adducting and rotating actions, on the other hand, increase as the eye is rotated inward. Hence, when this muscle is paralyzed, the eye to which it is attached lags below when the two eyes are lifted up, and owing to the unbalanced action of the other muscles diverges somewhat from its fellow, and undergoes torsion, so that the upper end of its vertical meridian diverges from that of the other eye. Moreover, the deficiency in elevation of the eye is most pronounced in abduction, while the relative divergence and the torsion of the vertical meridian are particularly marked when the eyes are carried inward to the median line and beyond it to the nasal side. Or, vertical diplopia occurs in looking up, which diplopia increases as

the eyes are carried up, and increases particularly in the upper and outer part of the field of fixation. In the very slightest cases, vertical diplopia may occur only in the last-named region; in more pronounced paresis, it will also be present both when the eyes are directed straight upward and when they are abducted in the horizontal plane; and in complete paralysis, it will be marked when the patient is looking straight to the front and will even be apparent for a short distance below the horizontal plane. The diplopia, besides being vertical (with the image which corresponds to the paretic eye higher) is also crossed; and the lateral divergence of the images is greatest when the eye is directed straight forward or when it is somewhat adducted. Both the vertical and the lateral diplopia may vary in amount from two or three to many degrees; and in those parts of the field where, owing to its small amount or to the compensating action of other muscles, the separation of the eyes fails to produce actual diplopia, its presence can be made out by the insufficiency tests, and we hence find a hyperphoria or an exophoria. The exophoria produced by paresis of the superior rectus amounts to three or four degrees even in the slight cases, and is distinguished from ordinary exophoria by the fact that the diverging power (abduction) of the eyes instead of being increased is either normal or slightly diminished.

In typical cases of paralysis of the superior rectus the tilting of the vertical meridian produces an apparent tipping of the false image which is in consequence inclined toward the side of the sound eye. This tipping is never recognized by the patient spontaneously, and, according to Mauthner, can scarcely be said to occur in practice. But its presence was noted in at least five of my cases—in three of them beyond the shadow of a doubt, in the others with reasonable certainty. The curious feature about these cases is that, while theoretically the tilting should have been most pronounced when the affected eye was strongly adducted, it was actually observed mainly when the eye was directed up and very slightly in.

When the paralysis is bilateral—and it was so, at least ap-

parently, in nearly all of the uncomplicated cases which I examined,—the tendency to crossed diplopia is even more marked than in the unilateral variety. On the other hand, the tendency to vertical diplopia in the primary position and when the eyes are carried straight upward, is diminished, or, if the muscles are about equally affected, is altogether absent. It is present, however, quite as before, in the upper and right-hand and the upper and left-hand portions of the field of fixation, and also in extreme abduction in the horizontal plane, so that the diagnosis of the bilateral is quite as easy as that of the unilateral variety. In making repeated examinations of these cases of bilateral paresis, I have noticed that the relative strength of the two paretic muscles seems to vary from time to time, so that in the primary position we sometimes get right hyperphoria, sometimes left hyperphoria, and sometimes absolute freedom from any tendency to vertical insufficiency.

There is no other condition which presents precisely the features just described except an isolated spasm of the inferior oblique. But the unchanging character of the phenomena observed, and the absence of any cause that could produce so unique a variety of a spasm render it extremely improbable that this can really be the sole condition present. Nevertheless, I am strongly inclined to believe that, in the bilateral form of the affection, spasm does play a part and that those cases which appear to be due to paresis of both superior recti are actually cases of paresis of one superior rectus associated with compensatory spasm of the inferior oblique of the same eye. This is probable on *a priori* grounds, since it is likely that in the endeavor to lift both eyes equally when there is paresis of one superior rectus, a specially strong nervous impulse is sent to both elevators of the paretic eye. If now this impulse affects both elevators equally, it would, if sufficiently strong to cause anything like a normal action of the paretic superior rectus, produce actual spasm of the unimpaired inferior oblique. This would in one way be an advantage, as tending to overcome the hyperphoria; but it would cause vertical diplopia in the opposite sense in the upper and inner part of the field of fix-

ation, and would increase the tendency to lateral divergence. This action then would be only partially compensatory.

My chief reason for thinking that this sort of compensation actually takes place is that in these bilateral cases the first examination often shows that the affection is strictly unilateral, while subsequent trials reveal involvement, more or less marked, of both sides. Moreover, as already stated, this secondary involvement is evidently a variable condition, since the effects it produces will in the same case at one time equal, at another time exceed, and at another again fall short of those produced by the primary paresis. This is precisely what we should expect in a case of compensatory spasm which must necessarily be variable in amount.

With this reservation then, that the diagnosis of bilateral paresis is open to question, we may say that the differentiation of these cases is easy, provided that we can establish with certainty the existence of diplopia having the characteristics given above.

The determination of this latter, however, requires the intelligent co-operation of the patient, and may be rendered difficult by his stupidity and inattention or by a perverted imagination which makes him see things as they are not. Hence no diagnosis should be regarded as final unless established by the concordant results of several examinations in which the conditions have been varied so that deception, conscious or unconscious, is impossible. This has been done in all of the cases here reported, and, in nearly all, the examinations have been repeated at intervals of several weeks or months; and no case so examined has been adduced unless the results obtained were uniformly accordant. Moreover, in all these cases the influence of complicating conditions has been taken into account, and wherever possible has been eliminated—*e. g.*, in the case of refractive errors by the use of the proper correcting glass. It is hoped therefore that these cases, few as they are, will suffice to illustrate, with reasonable fulness, the main symptoms attributable to paresis of the superior rectus.

These symptoms appear on the whole to be but slight. The most constant and characteristic is spontaneous diplopia (both lateral and vertical). This is generally transient, but while it lasts causes a disagreeable sense of blurring and confusion. Other symptoms in the order of their frequency are headache, pain, and a sense of weariness in the eyes, and a state of chronic irritation of the conjunctiva and lids which resists local treatment. In one of the uncomplicated cases a variety of scotoma scintillans was present, and the same or a similar phenomenon occurred also in one of the complicated cases. In one or two instances there has been spasm of accommodation, but whether this condition had anything to do with the paresis I cannot say. All the symptoms are aggravated by use of the eyes for close work, and remit when close work is abandoned; and the most frequent complaints came from school-children, musicians, and seamstresses who were obliged by their occupation to look long and steadily at near objects, but in whom no deficiency of accommodation and in most cases no notable error of refraction could be made out to exist.

The way in which the symptoms are produced seems tolerably certain. In the slight cases vertical diplopia is of constant occurrence only in extreme elevation of the eyes or in extreme abduction. Even in more marked paresis the tendency to vertical diplopia in looking straight ahead is slight, and it is absent altogether in convergence and when the eyes are depressed. That is, it is pronounced in those parts of the field of fixation which are practically never used, and is little marked or absent in those positions of the eye which are habitually employed. It is therefore neither a constant nor a very troublesome symptom. This is especially the case in the bilateral form. On the other hand, the exophoria produced by the condition, being quite pronounced when the eyes are directed straight forward and when they are moderately adducted, is constantly present. It is, moreover, particularly marked when the affection is bilateral. Even in slight cases this exophoria amounts to 3° or 4° for the distance, and to an equal or greater quantity for near

points. This is a considerable amount when it has to be overcome constantly, and the exophoria consequently must be the cause of more or less eye-strain, particularly when the eyes are employed for close work, which implies accurate definition of images and consequent necessity for the absence of diplopia.

The other symptoms—headache, pain in the eyes, and conjunctival and palpebral irritation—so far as they are attributable to this condition, are in all probability reflex phenomena due to the strain incurred in overcoming the exophoria.

The causal relation between the paresis and the chief symptoms seems certain. Other causative factors, such as refractive errors, insufficiencies, disorders of accommodation, etc., have been eliminated either by their non-existence or by the fact that their correction had afforded no relief.

In regard to the course pursued by these cases I can present no definite data, as but few of them have been under observation long enough to enable me to speak with certainty upon this point. But in those cases which I have been able to examine at long intervals, the vertical diplopia has remained unchanged in character and apparently also in amount, each examination being in this regard simply a repetition of the one before. The lateral diplopia and the exophoria seem too to be pretty stable factors, not varying much from one time to another, except that there seems to be on the whole a tendency for the exophoria to show a slow progressive increase. It would seem, therefore, that the condition which underlies the diplopia and exophoria must itself be comparatively stationary, and corresponding to this assumption is the fact that the symptoms also show very little alteration, except as they are affected by such disturbing factors as the entrance upon new occupations which throw additional work upon the eyes, or the use of faulty glasses, particularly prisms.

The treatment of these cases may be briefly dismissed. In marked paralysis with a constant vertical diplopia of many

degrees, it will be proper, if we can be sure that the condition is a stationary one, to perform advancement of the paretic muscle. The operation theoretically indicated, namely tenotomy of the inferior oblique of the other eye, is both practically inapplicable and can also be demonstrated to be unsound in principle. Tenotomy of a depressor muscle—inferior rectus or superior oblique—is, of course, out of the question, since it would produce a worse condition than that which it is designed to relieve. Tenotomy of the superior rectus of the other eye may replace the operation of advancement when the paresis is combined with esophoria. It is only a few cases, however, that present symptoms marked enough to justify operative interference of any kind. Only one such has occurred among those that I have examined, and in this advancement of the superior rectus was performed with satisfactory results.

In other cases prisms may be resorted to. Here, as the exophoria is the principal disturbing factor, prisms of two or three degrees before each eye, with base directed inward are indicated. If in addition there is any considerable amount of hyperphoria, a prism base down (or preferably base up) may be employed ; but in this case we must recollect that if the glass is to be used for near work (in which the eyes are naturally cast down somewhat), the vertically deviating prism must either be left out altogether or much diminished, because, with the eyes directed even a little below the horizontal line, the tendency to vertical diplopia decreases rapidly and soon disappears. Prisms were employed with quite satisfactory results in three cases; in two others, in which they were prescribed the patients did not get them, and in one case the result of their application was unknown, as the patient did not return.

To supplement muscular deficiencies with prisms, however, is like giving a lame man a crutch; it helps but does not cure his lameness, and in some instances by favoring muscular inaction really retards recovery. A more rational plan, it seems to me, is to exercise the internal recti. This

can be done by systematic practice with prisms placed base out before the eyes. Such exercise, even if it does not increase the actual power of the internal recti, at least enhances the facility with which these muscles work; and whether because of this or because of the stress that is at the same time thrown upon the accommodation, the result of such exercise at all events is that the exophoria diminishes or disappears altogether, at least temporarily.

In many cases the symptoms are too trifling to call for any form of special treatment. The administration of tonics and the enforcement of proper hygienic regulations will fulfil all the therapeutic indications.

A word finally in regard to the etiology of these cases may not be amiss. In the first place they are incontestably much more frequent than they have been supposed to be. Otherwise it is inconceivable that in a small number of unselected cases I should have hit upon so large a proportion in which the superior rectus was the only muscle affected; and while I believe that a more careful examination of all cases will show that paresis of the ocular muscles (particularly of the inferior rectus), is much more frequent than has been supposed, yet the preponderance of instances in which the superior rectus was paretic is still quite remarkable. Moreover, I am convinced from a consideration of the symptoms which they presented that many cases of hyperphoria which I examined before my attention was called to this subject and to the necessity of testing for diplopia in all parts of the field of fixation, were really instances of this affection.

Another noteworthy fact bearing on the etiology is that the affection is one pre-eminently attacking young persons. All the individuals examined were under thirty, and six were under fourteen. The mere statement of the ages at which the affection was observed, however, gives a very inadequate idea of its real prevalence among the young; for not only is there nothing to show in this series of cases that the paresis had developed at or shortly before the time of

observation, but, on the contrary, everything points to its having been in existence an indefinite time. Nay, more, there is nothing to indicate that the condition, in the uncomplicated cases at least, has not been of life-long existence, and in fact I have been led to believe that the paresis is really congenital or at least dates from infancy.

In none of the uncomplicated cases could any cause be assigned to produce the paresis. They have not, for example, been uniformly associated with errors of refraction, such as have been thought to be efficient factors in the causation of these muscular troubles. Four of the cases were practically emmetropic and nearly all the others had a moderate amount of hypermetropic astigmatism. None showed anisometropia of any amount. Only one case presented a large refractive error. In this there was mixed astigmatism of 5.50 D.; and it is rather a noteworthy fact that this was the only case in which there were no symptoms referable to the paresis, which therefore seemed to have occasioned no trouble. This is readily explainable, since the vision which the patient got, $\frac{2}{10}$, did not suffice to produce sharp definition, and hence a slight tendency to diplopia might exist without causing any appreciable addition to the blurring already present. It is a significant fact that it was not till this patient's vision began to improve under glasses that the tendency to compensatory action (evinced by the development of bilateral diplopia) began to be apparent.

Lastly it appears extremely improbable, from the age of these patients and the history which they present, that the paresis can be due to either a nuclear or an orbital lesion of the nerve-twig supplying the superior rectus. I am therefore driven to conclude that the condition in question is the result of a weakness of the muscle itself, due to congenital malformation or, more likely, to arrest of development. When we reflect how little occasion we have, comparatively speaking, to use the superior rectus for making any extensive movements of the eyes, the existence of a species of non-development from non-use seems not improbable.

BEARING OF THESE CASES UPON THE THEORY OF HETEROPHORIA.

In addition to the interest attaching to the etiology of this condition, it has, it seems to me, an important bearing upon the vexed subject of hyperphoria and indeed of insufficiencies in general. To one who has paid any attention to the problems relating to the muscular defects of the eyes the current theories of insufficiency contain much that is unsatisfactory. The tendency of the eyes to deviate when the temptation to preserve binocular vision is taken away—that tendency which we call insufficiency or by the better term of heterophoria—has been ascribed to various causes. Some write as if the faulty position were due to a want of power in the muscles (insufficiency in the proper sense of the word), and cite under this category cases in which muscles supposed to be weak are actually more powerful than their antagonists. Others regard insufficiency as due to the anatomical disposition of the parts, so that a condition obtains quite analogous to that which occurs in a concomitant squint. Others have signalized the importance of an excess or deficiency of accommodative effort in producing muscular deviations. But no one, it seems to me, has in an adequate and satisfactory way correlated all these different possible causes and pointed out that all or any of them may be operative, and that, just as we have a paralytic squint, a spastic squint, an accommodative squint, and a concomitant squint, so we may have and should distinguish between a heterophoria due respectively to paralysis, spasm, accommodative anomalies, and an excessive relaxation or tension of the muscles induced by faulty anatomical conditions. In emphasizing the difference between heterophoria and strabismus—a difference which, as far as symptoms are concerned, is, of course, most pronounced—we are apt to forget the fact long ago enunciated, that after all heterophoria is latent squint, and that consequently the same means of diagnosis and the same principles of treatment apply to the one as to the other. All of us recognize the fact that the means appropriate for the relief of a paralytic

squint and a concomitant squint are different; and we would not think therefore of attempting to remedy a visible deviation of the eyes without inquiring into the precise nature of the condition producing it. If this is so in the case of a manifest deviation or squint, it should be equally true of a latent deviation, or heterophoria; and my contention therefore is that in the latter condition we shall not employ our tenotomies or our prisms until sure of its precise nature and of its underlying cause. In other words, we must neither consider nor attempt to treat an insufficiency simply as an insufficiency, but must take into account and try to rectify the often complex causes which lie at the root of it. To this end we should, I conceive, in every case of heterophoria, in the first place eliminate the effect of accommodative errors by correcting the refraction; then determine by careful and repeated examinations of the diplopia and the tendency to deviation in the different parts of the field of fixation whether the heterophoria is a concomitant one (*i.e.*, is presumably due to anatomical conditions), or varies in a way to indicate muscular paralysis or spasm. When in this way we have found the cause of the condition and the muscle which is at fault, and are convinced that the condition itself is a stationary and not a variable one, we are ready to rectify the anomaly, supposing always that it still presents symptoms worth rectifying. This seems to me the conservative course, and it is one which I have myself pursued for several years past with very satisfactory results.

In closing I may say that in my own experience paretic heterophoria, of which the condition chosen as my subject is a type, constitutes a fairly large proportion of the total number of cases of insufficiency—a larger proportion certainly than I should have expected to find. They are not, however, nearly as numerous probably as the cases of concomitant (or anatomical) heterophoria in which an eye tends to deviate because one of its muscles is faultily attached and is consequently in a state of undue tension or relaxation. Cases of spasmodic heterophoria are probably not uncommon, occurring much oftener apparently than does true spastic squint. Accommodative heterophoria, although re-

garded by many as the most common variety, is not so in my experience; indeed, it is a rare thing for me to find that the correction of a refractive error, even when kept up persistently for weeks, has influenced at all the muscular balance of the eyes or the heterophoria which is its result.

TABLE OF CASES.

Note.—In preparing this table the following abbreviations, which the writer has employed constantly for the last four years, and which have proved very serviceable in recording cases of muscular trouble, have been used:

D, diplopia.
D′, diplopia at near points.
D//, homonymous diplopia.
DX, crossed diplopia.
DR, "right diplopia"; diplopia with image corresponding to right eye below.
DL, "left diplopia"; diplopia with image corresponding to left eye below.
SV, single vision.
LH, left hyperphoria.
RH, right hyperphoria.
S, esophoria.
S′, esophoria at near points.
X, exophoria.
X′, exophoria at near points.
P//, homonymous parallax.[1]
PX, crossed parallax.
PR, parallax with image of right eye lower.
PL, parallax with image of left eye lower.
Ef, "eyes-front"; both eyes directed horizontally forward.
Er, "eyes-right"; both eyes directed horizontally to right.
El, "eyes-left"; both eyes directed horizontally to left.
Eu, "eyes-up"; both eyes directed up.
Eu & r, "eyes-up-and-right"; both eyes directed up and to right.
Eu & l, "eyes-up-and-left"; both eyes directed up and to left.
Ed, "eyes-down"; both eyes directed down.
Ed & l, "eyes-down-and-left"; both eyes directed down and to left.
Ed & r, "eyes-down-and-right"; both eyes directed down and to right.
>, more than.
>>, steadily increasing.
<, less than.
<<, steadily diminishing.
= =, constantly the same.

Thus the formula for marked paresis of right superior rectus would be:

Ef, DL & X or LH & X, PL and PX. Er, DL (or LH) >>. El, DX. Eu, DL & X >>. Eu & r, DL >>, DX <<. Eu & l, DL << to SV. Ed, Ed & l, Ed & r, SV.

The characteristic feature, however, is contained in the expression Eu & r, DL >>, which alone is sufficient to make out the presence of the condition.

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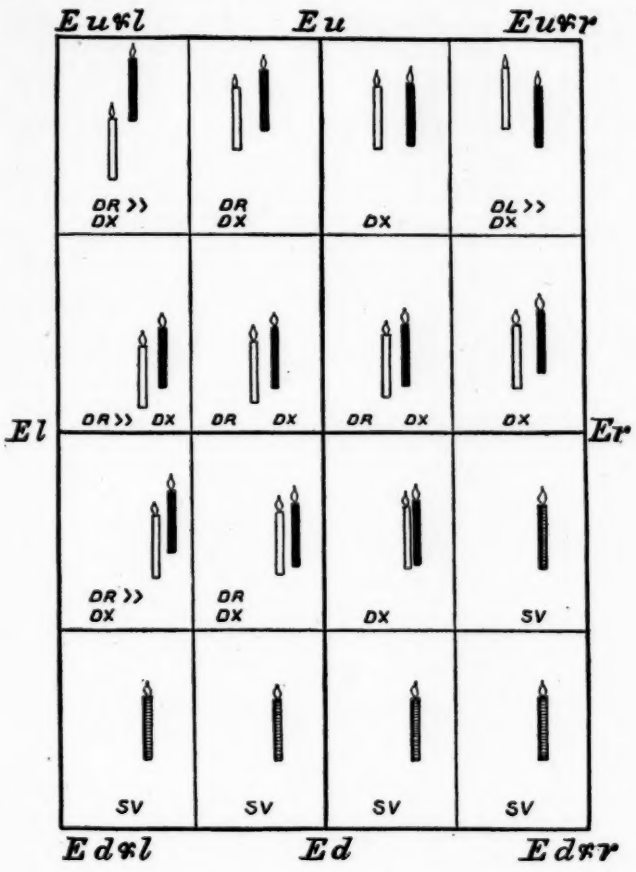
[1] By parallax is meant a change in the apparent position of the object of fixation when a screen is shifted from one eye to the other. If, for example, the patient fixes his gaze upon a mark made upon a flat surface (so that the mark cannot be projected upon any plane behind it), and upon carrying the screen from the right eye to the left this mark appears to move to the right, the patient is said to have homonymous parallax (P//); if it moves to the left, he has crossed parallax (PX); if it moves down, he has right parallax (PR); if it moves up, he has left parallax (PL). Parallax in this sense is only diplopia obtained by a special artifice, and, like any other form of diplopia, can be measured in terms of the prism which causes its abolition.



This Diagram represents a case of paresis of both Superior Recti, the muscle of the left eye being the one mainly affected; or a paresis of the left Superior Rectus with spasm of the left Inferior Oblique. Red glass placed before left eye. Nomenclature as upon preceding page.

I.—UNCOMPLICATED CASES.

No.	Date when first Seen.	Name and Occupation.	Age.	Sex.	Muscle Affected	Other Muscular Affections.	Resulting Heterophoria and Diplopia.	Refraction.	Symptoms.	Treatment.	Course and Results.	Date when last Seen.
1	Nov. 5, 1891.	H. F., schoolboy.	12	M.	Both, especially L.	None.	*For distance.* PX, slight. PR and PL on alternate days. X, 0° (increasing on final test to 2°–3°). LH, 1°–2° (by abducting-prism test). Abd. 6° (finally only 4°). Adduction (test of Feb., 1894) less than 15° even at near points. Eu, DR >> rapidly. *For near.* X', 5° or 6°. Eu, DR >> and DX. Eu & l, DR >> (very rapidly). DX. Eu & r, DL, DX. Er, DX. El, DX marked, DR. Tilting of one or both images frequently observed.	Hypermetropic astigmatism. [Using for reading + 0.75 D. cyl. each, prescribed after examination under atropine. Glasses given by another oculist 6 or 7 months before].	Severe daily protracted headaches coming on whenever eyes are used for any purpose requiring fixed attention. Somewhat less with glasses, but not notably so. Looking up causes him great pain in the eyes, and tests with prisms, etc., cause headache. Eyes become tired very soon when close work is done. Also has often blurring of sight, with occasional spontaneous crossed and vertical diplopia (DX and DR). Once a transient attack of alternating hemianopsia.	Tentative use of prisms correcting hyperphoria and exophoria (cylinders during this time being discarded). Afterwards prisms prescribed with cylinders.	Prisms alone caused great relief of headache, blurring, and asthenopia. By use of prisms and cylinders combined was so much improved as to be able to work all day. Headaches not entirely relieved and afterwards seemed to return, when they were again relieved by astigmatic glasses given by another practitioner. Hyperphoria had in the meantime diminished, so that now prismatic glasses overcorrect this element.	Feb. 17, 1894.
2	Feb. 18, 1893.	B. A., schoolgirl.	9	F.	Both, in almost equal degree.	None.	*For distance.* X at first only 3°, afterward increasing to 8° or more. With red glass, DX changing slightly in Er and El. Abd. 8° —, but after using prisms increased to 10°. Adduction (at distance) especially after wearing prisms almost 0°, and very hard to train. *For near.* X', 6° or more; increasing to 15° after constant use of prismatic glasses. Eu, DX. Eu & r, DX and DL >>. Eu & l, DX and DR >>. Ed, SV. [Numerous examinations gave absolutely con-	Right eye emmetropic; Left eye slightly hypermetropic (+ 0.50 D). [Examination under homatropine.]	Conjunctival irritation and pain and lachrymation; not improved by local astringent treatment. Occasional lateral and vertical diplopia. No headaches. Symptoms aggravated by schoolwork, and occurring chiefly when eyes are engaged in close work; remit at other times and absent during vacation. Afterwards, when exophoria had notably increased, symptoms more marked when using eyes for distance.	Prisms (3° base in and 2° base in) given (Feb., '93) for near work; afterwards (Dec., '93) for far also. Training of adduction (Feb., '94).	Prisms, when used for near work only, seemed to cause marked relief of symptoms; when prescribed for distance also, aggravated symptoms. Symptoms finally relieved completely by exercise of adduction with prisms; X finally 0° and X', 2°–3° only.	March 12, 1894.

							Eu, SV. [Numerous examinations gave absolutely concordant results, except that first record taken does not reveal any involvement of R. superior rectus]. Final examination shows DX in Ed.					
3	June 29, 1893.	G. M., seamstress.	26	F.	Both.	—	*For distance.* X, 5°. *For near.* X′, 8°. Ef, DX (diminishing slightly in Er). Eu, DX. Eu & r, DX and DL >>. Eu & L, DX and DR >>. Ed, DX but vertical diplopia slight or uncertain. [Repeated examinations on two separate days by different observers.]	Slight hypermetropia (+ 0.50 sph. accepted).	After a moment's looking at any object (especially when doing fine work), object blurs and becomes double. (Glass of + 0.50 sph. does not prevent this). At other times a spot followed by a light cloud floats before the sight, or she has a sudden attack of amaurosis. These attacks followed by headache. Sees well on first waking up, but later in day troubles come on.	Given prism 2° base in each eye.	Did not use prisms, as symptoms had in the main disappeared upon her giving up her work as a seamstress.	Reported by letter, Feb. 18, 1894.
4	Sept., 1893.	H. G., cutter.	28	M.	R. (afterwards of L. also).	None.	*For distance.* X, 2° +. LH (only a trace after affection had become bilateral). Adduction, 15° (with great difficulty). *For near.* X′, 3° +. Eu & r, DL >>. No other vertical diplopia at first examination. At second examination, showed also, Eu & l, DR >>. Eu, DX. No other diplopia. [Examinations on 3 separate occasions several weeks apart.]	Right eye emmetropic; Left eye myopic (— 0.50 sph. under homatropine).	Pain and irritation of eyes and conjunctival discharge, especially in evening. Not relieved by astringent treatment. Sense of straining in eyes. Headaches now and then.	Given prism 2° base in each to use if symptoms recur.	Symptoms disappeared spontaneously on his giving up reading, of which he had done a good deal; hence did not use prisms.	Feb. 23, 1894.

No.	Date when first Seen.	Name and Occupation.	Age.	Sex.	Muscle Affected.	Other Muscular Affections.	Resulting Heterophoria and Diplopia.	Refraction.	Symptoms.	Treatment.	Course and Results.	Date when last Seen.
5	Nov. 11, 1893.	C. U., school-girl.	12	F.	R. (mainly).	None.	*For distance.* PX, 2° + ; PL, decided. X, 0°–3°, LH, 0°–1°. *For near.* Eu & r, DL and DX. Eu (extreme), DX. Eu & l, DX. Er, tendency to DL. El (extreme), DX. No diplopia elsewhere except in final examination, when slight DR in Eu & l (compensatory action of inferior oblique) was observed. [7 or 8 examinations made on 4 different days.]	Mixed astig. (cyl. + 5.50 D with sph. − 2.00). [Examination under homatropine.]	Symptoms mainly those due to error of refraction—poor vision and occasional headaches.	Correction of refractive error.	Gradual improvement of sight under use of glasses, V when last tested $\frac{20}{20}$.	—
6	Nov. 17, 1893.	M. B.	9	F.	R.	None.	*For distance.* PX (= 2°) and PL. X, 3°. LH slight. Abd. 5°. *For near.* Eu & r, DL. No diplopia elsewhere.	Emmetropia and V normal. [Examination under homatropine.] Accommodation normal.	Pain in eyes and almost constant frontal headaches for past 2 months. Cannot see well to read, and even at distance objects blur. Had scarlet fever in May, and to this mother attributes present trouble, but symptoms did not begin directly after illness.	Given prism 2° base in each for near work.	Did not return.	Did not return.

II.—CASES COMPLICATED ONLY WITH A LATERAL DEVIATION.

7	Dec. 27, 1889.	J. T. R.	20	M.	R.	Insufficiency of left internal rectus (? or spasm of right	*For distance.* Eyes diverge behind screen. PL, 4°–5°. PX, 12°. X very variable. LH 2°–6°. Abd. 22°.	Hypermetropic astigmatism. R. + 1.00 sph. ⊃ + 0.75 cyl. L. + 0.75 sph. ⊃ + 0.75 cyl.	Very severe headache at times. Used to have diplopia when young, and then right eye diverged more than	Advancement right superior rectus, tenotomy left superior rectus,	Final result of operations: correction of vertical diplopia for	April, 1890. Report by letter, Feb.

						externus).	Adduction, 11°–15°. Excursion test practically same as for near objects. Produces voluntary DX by turning out right eye. *For near.* Eu & r, DX >>, DL >>. Eu & l, DL << to SV, DX <<. Er, DX and DL. PX >>. El, PX << to o°. Image formed by right eye tilted to left.	under atropine. Developed spasm of accommodation after use of correcting glasses.	at present. Cannot read with right eye alone.	advancement right internus. Correction of astigmatism. Exercise of adduction by prisms.	looking directly forward and for position of convergence; exophoria converted into slight esophoria (about 1°). Adduction 38°. Headaches relieved by glasses Can now use right eye for reading, and vision in it has improved (report of Feb., 1894).	25, 1894.
8	Aug. 23, 1890.	L. H.	11	F.	L.	Insufficiency of both externi, especially L.	*For distance.* D// and DR (inconstant). D// >> laterally, especially in El. DR >> in El. P// and PR. S, 7°–20°. RH, slight or o° (by abducting prisms). Abd. 5°–8°. Both eyes deviate markedly in behind the screen. *For near.* Eu, D// and DR. Eu & l, DR >> and D//. El, D// and DR. Er, Eu & r, Ed, no diplopia. [Numerous examinations made on four or five separate days.]	Hypermetropia and astigmatism. R. + 2.50 sph. + 0.75 cyl. L. + 2.00 sph. + 0.50 cyl. [Examination under atropine.]	In Jan., 1889, first treated for asthenopic troubles (pain in eyes, difficulty in reading, etc.). Given glasses (R. + 2.00 sph. ⌒ + 0.75 cyl.; L. + 1.50 sph. ⌒ + 0.50 cyl.). Six months ago attack of diphtheria followed by paresis of laryngeal and some trunk muscles and strabismus. Sight became blurred, and she developed spasm of accommodation.	Advancement both externi; exercise of adduction with converging prism.	Nearly complete correction of convergent squint.	Jan. 30, 1891.

No.	Date when first Seen.	Name and Occupation.	Age.	Sex.	Muscle Affected.	Other Muscular Affections.	Resulting Heterophoria and Diplopia.	Refraction.	Symptoms.	Treatment.	Course and Results.	Date when last Seen.
9	Aug. 27, 1892.	S. M. C.	25	F.	R. (afterwards of both).	Esophoria (? accommodative).	*For distance.* P 0° or L and //. S, 3° or more (less with refraction corrected; greatest when eyes are under influence of homatropine and refraction is uncorrected). LH, 1°–2° (by diverging-prism test); at times 0° (especially when refraction is corrected), and then S less. At last examination, RH, 1°. Abd. 5°–6°. Adduction, 20° easily. D// in El, not in Er. *For near.* S' several degrees (0° with glass). Eu & r, DL. At last examination also showed, Eu & l, DR and D//. Eu, D//. Ed, SV everywhere. [Several examinations at long intervals.]	Hypermetropia and astigmatism. R. + 1.00 sph. + 0.50 cyl. L. + 1.25 sph. (under homatropine). Evidently some accommodative spasm. Range of accommodation good, but has transient uniocular blurring of sight indicative of temporary accommodative failure.	Daily headaches (frontal), and pain referred to back of eyes. Relieved temporarily by use of glasses, but recurring. Cannot use eyes for near work even with the glasses without speedy fatigue. Marked pain in eyes produced by looking up.	Correction of refractive error. Given R. + 0.50 sph. + 0.50 cyl. L. + 0.75 sph. for constant use. Given (Feb. 21, 1894) prisms for esophoria.	Prisms caused no relief.	Mar. 31, 1894.
10	March 20, 1893.	T. K.	13	M.	Both, especially L.	Divergent strabismus.	*For distance.* Eyes diverge markedly, producing regular divergent concomitant squint, which usually affects R. eye. Eyes diverge behind screen, and in making movement of redress, eyes (especially right) shoot beyond the mark, and then return by jerky motion to position of fixation. DX of 6°–8°, and DR or sometimes DL. *For near.* Converges normally, but with much effort, and has binocular fusion near point of 3 inches. Ef, DX (with red glass) and DR or sometimes DL. Eu & l, DR >>. Eu & r, DL >>. No diplopia in Ed. [Several examinations.]	Emmetropic. V. $\frac{20}{12}$ each. Has been using a glass of + 0.75 for both far and near, prescribed Nov., 1890. Used these for a year and then stopped.	Occasional spontaneous diplopia. For 6 years has been in the habit of closing right eye when he wishes to see at a distance. Screws up eyes when he reads; eyes get tired and pain him after reading. Headaches rare.	None.	Symptoms remained same during the 11 months when he was under observation.	Feb. 17, 1894.

III.—CASES COMPLICATED WITH OTHER VERTICAL DEVIATIONS.

11[1]	March 1886.	A. D., physician.	27	M.	L.; (afterwards R. (traumatic).	Esophoria; lately has shown involvement of depressors of eye.	*For distance.* RH, 1°–2°; S, 2°–3°. Abd., 3°. Adduction at first very limited. Since operations—hyperphoria 0° or only a trace. Diplopia for distance same as for near, except that in Ef gets sometimes D//, sometimes DX, and the normal tendency, unless the eyes have been used for near work, is to D// in Ef; and the D// in Er is marked for distance and increasing. *For near.* X' 2°–3°. Ef, SV. Er, D// slight, DL slight. El, DX marked, DR. Eu & l, DX >> greatly, DR >> (marked.) Eu & r, DX >> slightly. DL >>. Ed, D// >>. Ed & r, DR and //. Ed & l, DL slight. In Eu tilting of image formed by right eye.	Hypermetropic astigmatism developing into mixed astigmatism (+ 2.25 and + + 1.75 D. cyl. with — 1.00 sph.).	Severe periodical attacks of migraine (infrequent). Sense of straining and drawing of eyes often.	Tenotomy R. superior rectus and repeated tenotomies of lateral muscles. Correction of refraction (after first series of tenotomies).	Partial correction of the hyperphoria by a prism before the tenotomies were done caused marked relief of symptoms. Tenotomies produced similar relief, although not an absolute one.	Feb., 1894.
12	Dec. 11, 1890.	F. T. C., college tutor.	28	M.	R. (slight consecutive affection of L).	Insufficiency of right inferior rectus.	*For distance.* PX and PL. DX and L in Ef. X, 4° (later 7°). LH, 1°–2°.[2] Abd. 8° —. Adduction at first small, afterwards readily performed. *For near.* X' many degrees. Ef, DX and alternately DR and DL. Eu, DL >> and DX >>. Eu & r, DL >>. Eu & l, DR >> (but not marked). Ed, DX >> and DL, changing to DR. Ed & r, DR >>. Ed & l, DR << to SV, then DL. On final test shows tipping of both images in Eu & l.	Myopic astigmatism (— 0.25 D. cyl. axis nearly horizontal). [Examination under homatropine.]	Vertical and lateral diplopia occurring spontaneously at times, and also produced by voluntary relaxation of interni. Headaches on doing close work. Blepharitis for many years.	Correction of refractive error. Local treatment for blepharitis.	Headaches relieved completely and blepharitis in part by glasses; blepharitis recurs when eyes are used much for near work, and headaches recur if glasses are laid aside. Exophoria has evidently increased during time of observation.	Feb. 15, 1894.

[1] The interest in this case lies in the fact that it has been under observation for such a long period (8 years), during which the involvement of the left superior rectus and the condition produced by tenotomy of the right have remained essentially the same, as shown by the eyes staying on the same level. It is also of interest as showing how much relief may sometimes be given by prisms, and how the signs of a traumatic paresis are precisely those of the non-traumatic variety.

[2] Hyperphoria was, according to the testimony of a competent observer, present at least two years before my first examination.

No.	Date when first Seen.	Name and Occupation.	Age.	Sex.	Muscle Affected.	Other Muscular Affections.	Resulting Heterophoria and Diplopia.	Refraction.	Symptoms.	Treatment.	Course and Results.	Date when last Seen.
13	Oct. 17, 1891.	N. A., schoolboy.	13	M.	Both (especially R).	Insufficiency of both inferior recti (especially left), and esophoria.	*For distance.* P// and PL. LH, 2°–3°. S, 2°–5°. Abd. 4°. Eu & r, DL >>, D// slight. Eu & l, DR slight. Eu, DL. El, D// >>. Er, D// >>. Ed, D// >>. Ed & l, DL >>, D//. Ed & r, DR and D// >>. *For near.* Diplopia as for distance, except that in Eu & l gets no diplopia.	Hypermetropia (R. + 0.75 sph. L. + 0.75 sph. + 0.25 cyl. 90°).	Ever since measles, 2 years ago, right eye aches and burns when used for near work. Can read well if R. eye is closed, but not if L. eye is closed. Conjunctival congestion.	Astringent collyrium.	Marked improvement, although when he reads a good deal eyes still ache.	Dec. 31, 1891. (Reports received in 1893 indicate that improvement has continued.
14	Feb. 28, 1893.	E. S., schoolgirl.	8	F.	Both.	Insufficiency of both superior obliques (coming on later).	*For distance.* X, 3°–4° (afterwards less). No hyperphoria, but later on gets RH with diverging prism and LH with converging prism. PL very slight. *For near.* S', 2°–3°. Eu & l, DR. Eu & R, DL. At first examination no other diplopia. [Repeated examinations.] Afterwards (Dec., '93) shows same and also : Ef, DL (inconstant). Ed & R, DL.	Hypermetropia of + 0.50 D shown under homatropine. V. normal.	Constant headaches over and between eyes (dated from injury received 3 months before—blow upon head from falling down stairs—but had had the same sort of headaches before). In later examination (Dec., '93) also states that she has pain in eyes; has to go up close to objects to see them ;	None.	Symptoms same.	Dec. 23, 1893.

							Ed & l, DR. And in Eu, image of L. eye tilted to R. Ed, image of L. eye tilted to L. (?)		has occasional spontaneous vertical diplopia; sometimes red or blue lights come before eyes, clouding the sight. At times stands still and shakes			
15	June, 1893.	B. S.	28	F.	Both.	Esophoria. Insufficiency of left inferior rectus (developing later).	*For distance.* S, 1°–2°. Abd. 6°. Hyperphoria 0° or LH 1° (on one examination). *For near.* S', slight. Eu & r, DL >> and DX. Eu & l, DR >> and DX. Ed, no diplopia. [Several tests]. Examination, Feb. 17, '94, shows also Ed & l, DL.	Hypermetropic astigmatism (+ 0.75 sph. ⌒ + 0.50 cyl. R. E., and + 0.75 sph. ⌒ + 0.75 cyl. L. E.) Given R. + 0.50 cyl. axis 20°. L. + 0.75 cyl. axis 160°. With these, V. $\frac{1}{1\frac{5}{6}}$ +. [Examination of refraction made under homatropine.]	Headaches (frontal) frequent, coming on especially in morning, and associated with pains in eyes. In a bright light has to strain and screw up eyes to see well.	Astigmatism corrected by glasses.	Headaches greatly improved by glasses.	Feb. 17, 1894.

SUMMARY OF SYMPTOMS.

	Uncomplicated Cases.	Cases Complicated with Lateral Deviation.	Cases Complicated with Vertical Deviation.
Spontaneous diplopia	1, 2, 3	7, 10	12, 14
Blurring of sight	1, 3, 6	—	—
Pain in eyes	1, 6	9, 10	13, 15
Conjunctival irritation	2, 4	—	12, 13
Fatigue and sense of strain in using eyes	1, 4	9, 10	11, 15
Headache	1, 3, 4, 6	7, 9	11, 14, 15 [1]
Scotoma scintillans	3	—	14
Spasm of accommodation	—	7, 8	13
Transient hemianopsia	1	—	—
Inability to use the affected eye for reading	—	7	13

SUMMARY OF TREATMENT.

	Case.	Result.
Advancement superior rectus	7	Improved.
Exercise of adduction	2	Relieved.
	7	Improved.
Application of prisms for exophoria and hyperphoria	1	Improved temporarily.
	2	
	11	
	6	Result unknown.
	3	Did not wear glass prescribed.
	4	
Local astringent treatment	2, 4, 12	Ineffectual.
	13	Caused improvement.

[1] Also in 12, but here apparently due to another cause.

CATARACT: MORPHINE HYPODERMICALLY, AS A MEANS TO PREVENT PROLAPSE OF THE IRIS IN SIMPLE EXTRACTION.

By EUGENE SMITH, M.D.,

PROFESSOR OF OPHTHALMOLOGY AND OTOLOGY IN THE DETROIT COLLEGE OF MEDICINE, OPHTHALMIC SURGEON TO ST. MARY'S HOSPITAL; SURGEON-IN-CHIEF TO ST. MARY'S HOSPITAL, FREE EYE AND EAR INFIRMARY, ETC.

THE desire to do away with mutilation of the iris in cataract extraction has for a long time interested ophthalmic surgeons. The following extracts from the writings of several leaders in ophthalmic science indicate the principal danger at the present day, which is the probable reason why not *all* ophthalmic practitioners make ***simple extraction*** their common method.

In my own efforts at simple extraction during the past three years, covering nearly one hundred cases, I have met with the experience which other shave had, and how to eliminate this ***bête noire*** has caused much thought. Have I found a method? I think I have, for certainly it has acted most charmingly in my hands so far.

Wecker says: "L'extraction simple prendrait immédiatment le premier rang, si on arrivait à éliminer les prolapsus de l'iris." Also: "L'emploi de l'eserine, ne m'avait pas donné une garantie sufficiente contre les prolapsus et les enclavements ultérieurs de l'iris."

Knapp says: "The liability of prolapse of the iris is the weak point in simple extraction"; and again: "If, in spite of reiterated trials of reposition, the pupil does not become circular, or is deformed by the movements of the eye, iridectomy is indicated."

Noyes says: "Prolapse may be caused by efforts of the patient to keep his eye still, the discomfort causing unconscious efforts, and it may be caused by traction of the recti or pressure of the orbicularis."

It has been remarked by many that a simple extraction requires a greater degree of tranquillity on the part of the patient, a condition of which many are incapable, for ordinarily there is pain or discomfort for five to six hours after operation.

As bearing somewhat upon my method I will state that in the hospital I operate in the amphitheatre, from which the patients walk three or four hundred feet to the male ward, or, if females, five to six hundred feet to the elevator, thence two or three hundred feet to their beds.

I began this treatment the latter part of October, 1893, and have operated upon sixteen cases, taken as they came, without selection, operating upon most of them before my class in the hospital.

In one case the wound did not close for four days, but eventually healed with *perfect result*, the pupil remaining contracted till after the wound healed.

In another case I had operated upon the left eye a year before and had prolapse of the iris. The iris of right eye after the flap was made, both *before* and *after* the extraction of the lens, showed a peculiar lack of tonicity, and a most remarkable tendency to get into the wound. I called the attention of my class to the fact, and also stated that I considered it a typical case for experiment. I had replaced the prolapse three times with the spatula, after dropping a one grain solution of eserine *upon the prolapse*. This case healed with perfect results, as did one more with similar peculiarity of the iris. The balance of the sixteen cases presented nothing peculiar, but all healed perfectly. Two cases had rather severe *coughs*. My manner of operating offers nothing new; the incision comprises the upper half (or nearly) of the cornea. I still like to extract part of the anterior capsule with my capsule forceps, which I have modified by putting the teeth *on a plane with the blades*, not setting them backwards as at first; there is now no difficulty or awkward-

ness in using them. After the toilet of the lens, I drop a one grain solution of eserine (salicylate of physostigmine) in the conjunctival sac, give a *hypodermic injection of ¼ grain of morphiæ sulph.*, wait a few minutes, then let the patients go to bed, where I like to keep them from twenty-four hours to two days. Eight hours after the first hypodermic injection of morphia I give another, and the following morning a third. This generally keeps the pupil contracted *ad maximum* from thirty-six to forty-eight or more hours.

The morphine injection also relieves the discomfort immediately following the operation, produces tranquillity, checks a cough if present, and does away with involuntary traction of the recti or orbicularis muscles. Given hypodermically morphine *does not produce vomiting*. Whether the effect of morphine in producing contraction of the pupil be due to its sedative action upon the sympathetic nervous system, in consequence of which the capillary vessels of the iris become somewhat engorged, and the pupil contracts strongly, or the contraction be due to a stimulation of the motor-oculi centres, I do not know, but that it seems to fulfil many indications and have a most happy effect I have demonstrated to my own satisfaction in the sixteen cases in which I have employed it.

A NEW CENTRING INSTRUMENT.

By S. J. BUMSTEAD, M.D., Decatur, Ill.

(*With three figures.*)

NOTWITHSTANDING the danger that confronts the modern oculist, of having his consulting-room crowded with apparatus pertaining to his profession, I venture to offer an instrument that will accurately centre the lenses upon the visual line of each eye, provided the oculist and the optician will perform their share of the work correctly. Perhaps many oculists and most opticians believe there is no necessity for such an instrument, that the present methods of making a good guess at the centre of the pupil of each eye enables them to tell the optician just where to place the optical centre of his lens, in order to have the visual line pass through it on its way to the macula. This is, however, a fallacious belief. I am also willing to admit that in very many cases, especially where weak convex or concave glasses are prescribed, to be off of the visual line to the extent of 4 or 5 millimetres will never be noticed by the patient. But how is it with the few cases, and they are too many, where the muscles are trembling on the verge of equilibrium? Such a patient may be very nervous, astigmatism may also be present, and the condition of the muscular balance barely normal. Suppose this patient requires a convex lens of 3 dioptries, and by the present inaccurate method of finding the visual line, by finding the centre of the pupil, the lenses are placed 4 millimetres from the visual lines, 2 in each eye. This is even sufficient to equal a prism of more than one degree. When we go to still stronger lenses, as

we must frequently do, this decentring effect increases very rapidly in prismatic degrees. I doubt not that many of our cases of esophoria and exophoria have been promoted by this faulty centring of spectacles. The article on this and kindred subjects, by Dr. Ward A. Holden, in vol. xx. of these ARCHIVES, will more thoroughly explain the reasons for this belief. Those who have prescribed prisms for the various defects, and in a few months have found an increase of the trouble amounting to several degrees, will not think it strange that a decentred lens will produce the same result in a nervous subject.

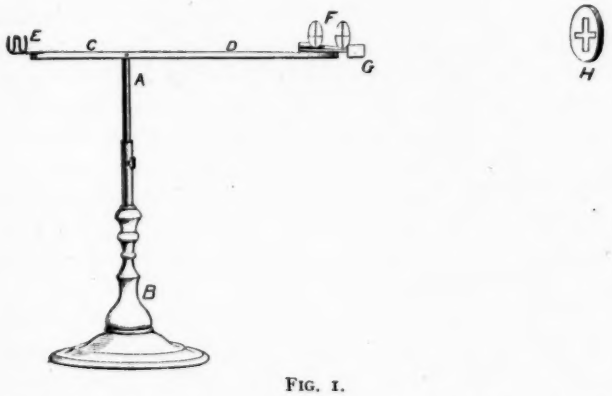


FIG. 1.

In Fig. 1 the instrument is represented. *A B* is an upright stand, of convenient height, and made to be raised and lowered six inches or more, as desired. *C D* is a horizontal bar 30 centimetres long, which is fastened securely to the vertical stand. At *E* is a nose-piece and cells for the glasses the patient may need. At *F* are two round frames, each of which has a horizontal and vertical black wire stretched in the respective diameters. These frames rest upon a straight frame attached to the horizontal bar *C D* at right angles to said bar. The wired frames are constructed with a right and left screw, the milled head of which should be at *G*, by means of which the frames can be separated or brought nearer each other. A scale is attached, which gives accurately

in millimetres the distance between the centres of the two wired frames. At a distance of 3 metres from F a black screen is suspended, on which is a white cross, H, the lines of cross from 2 to 3 *mm* in thickness.

The person whose eyes are under examination is placed at E, and these cells should be capable of sliding back and forth in order that they may be as accurately centred for the individual as the old method will enable us to do. The instrument must be on a level with the cross target, then first one eye looks over the crossed wires until they fall upon the cross, then without moving the head the other eye attempts this, and if unable to see the cross the milled head G is turned until with the second eye the black crossed wires fall accurately upon the cross. Then the wires will fall upon the cross binocularly, but to be sure of this, one eye will be covered, then the other, and if each time without any movement of the head, the wires are seen upon the cross, one can be very sure that the visual lines cut the crossing of the wires, and the scale will show this distance. In the figure 2 below, if $C\,D$ is this distance, then $A\,B$ will

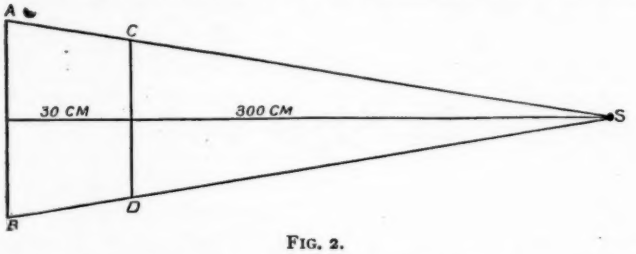


FIG. 2.

be the distance between the visual lines at the spectacle cells E. If the distances are those given, $A\,B = \frac{11}{10} \times C\,D$, so that in order to get the distance between the visual lines at the point where the spectacles are, *i. e.*, the proper distance between the centres of the lenses, there must be added to the reading of the scale, one tenth of itself. To avoid this reduction, the scale might be so ruled as to always read the distance $A\,B$ directly. Otherwise a table of all possible distances between the visual lines in millimetres could be printed, in which this $\frac{1}{10}$ addition was made for each one.

That the scale would be best, is evident from the fact, that the proper centring for reading glasses could also be added to that determined for the distance glasses. That the centres for both cannot be the same is apparent. This can also be accurately determined and not guessed. Figure 3 will explain the procedure:

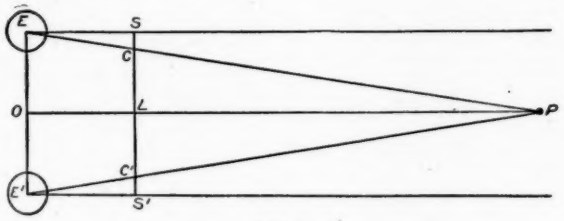


FIG. 3.

If E and E' be the centres of the eyes, and SS' the plane in which the spectacles are, SS' is practically the distance between the centres of the distance glasses, and CC', that for the reading glasses, where OP is the reading distance. Evidently $\frac{CC'}{SS'} = \frac{LP}{OP}$. If, for example, OP is 12 inches and OL one inch (or 36 *cm* and 3 *cm*), $\frac{LP}{OP} = \frac{11}{12}$; so that the centres of the reading glasses should be $\frac{11}{12}$ as far apart as those of the distance glasses. In other words the reading glasses should be centred just $\frac{1}{12}$ nearer together than the other glasses.

This instrument has not yet been manufactured. I concluded, however, to give the idea to the profession so that those who cared for it could have it made. I will render any assistance in my power, to any instrument-maker who wishes to construct one or more for his customers. If desired the vertical centre of the visual line could be determined by a sliding clamp to catch under the chin, with a scale upon it showing distance from this point to visual lines. Where the optician places frames and all upon the patient himself, this would enable him to centre accurately both vertically and laterally, which has probably not heretofore been accomplished.

A CRITICAL COMPARISON OF LEBER'S THEORY OF DETACHMENT OF THE RETINA, WITH THE DIFFUSION THEORY.

By Prof. E. RÆHLMANN, Dorpat, Russia.

Translated by Dr. Ward A. Holden.

(*With 8 Figures on Plates I. and II. of Vol. XXVII., Germ. Ed.*)

THE condition of detachment of the retina has not been satisfactorily explained. The last comprehensive treatises of Leber and Nordenson have presented much material, without however definitely settling the question.

As to the cause of the detachment we find the two old views still held, one attributing the detachment to a transudation from the choroid pushing the retina inward, while the other attributes the detachment to traction from the side of the vitreous.

The latter hypothesis, formerly accepted by H. Müller, Stellwag, Woinow, and others, has lately been taken up by Leber and his pupil, Nordenson, and supported by a number of arguments and by the results of microscopic examinations.

The former hypothesis has now almost no adherents, for the reason that a transudation must occupy space and increase the intraocular tension, when it is explained in the old way. This difficulty is overcome, however, when we consider the detachment of the retina as a diffusion symptom, as I have previously done.[1]

[1] *Graefe's Archiv*, xxii., 4.

My hypothesis, like that of Leber, presupposes an affection of the vitreous, but in my opinion it is not the fixed, as Leber believes, but the fluid components of the diseased vitreous that are responsible for the detachment.

In the production of every transudation or exudation, besides filtration processes there are diffusion processes to be considered. In the eye the vitreous is separated from the choroidal vessels by the retina. Hemorrhagic, serous, or other exudations from the choroidal vessels must collect first beneath the retina. As the opponents of the secretion theory have said, such exudations are impossible since there is no space for them, and since the exudation would increase the intraocular tension and thus prevent its own increase.

It is different when the contents of the ball diminish proportionately to the increase in the exudation. Such is the case when the exudation or the serum in the choroidal vessels can change places with the fluid vitreous by diffusion. Like all transudations, those from the choroid are rich in albumen. Granted an exudation beneath the retina, the fluid vitreous and the exudation would change places in accordance with the ordinary physical laws of diffusion. The thick retina, like all animal membranes, allows the passage of albumen only with difficulty, while the fluid of the vitreous, being relatively poor in albumen, passes readily through the retina into the albuminous exudation, or is taken up by the choroidal vessels.

Thus the retina is pushed forward by the exudation, and place is made for the latter by the resorption of the fluid in the vitreous. An eye with a fresh spontaneous detachment of the retina represents a dialysator, the retina being the membrane, with a saline fluid before it and a concentrated albuminous fluid beneath it.

In the Leber-Nordenson hypothesis the acting cause of the detachment is held to be a shrinking of the vitreous. This ruptures the retina and fluid from the vitreous cavity passes beneath it. This sub-retinal fluid is originally pressed out in consequence of the shrinking of the vitreous, and collects posteriorly between the shrunken vitreous and the retina.

The hypothesis assumes a shrinking of the vitreous, an adhesion between vitreous and retina with rupture of the latter, a posterior detachment of the vitreous, and the passage of fluid from the sub-vitrinal space through the rupture in the retina, this fluid being found beneath the detached retina.

The shrinking of the vitreous. Leber and Nordenson have described a number of eyeballs showing shrinking of the vitreous, but in all of these the detachment of the retina was old. We know clinically that progressive tissue changes go on in eyes with detachment of the retina, and that as a rule the vitreous becomes more and more opaque; while the investigations of H. Müller, Schweigger, Schiess-Gemuseus, Woinow, and others, have shown that after the penetration of a foreign body, and after irido-choroiditis, the vitreous is frequently transformed into fibrous tissue.

The frequency with which we find cicatricial shrinking of the vitreous without detachment of the retina, and the frequency with which we find fresh cases of detachment without shrinking of the vitreous, shows, contrary to Leber's view, that the detachment is in great measure independent of the shrinking of the vitreous.

Every oculist has seen cases in which the vitreous contained cicatricial bands without the retina being detached, such as Hirschberg's cases of gun-shot wounds and Sattler's case of cysticercus in the vitreous. I myself have several times examined eyes having linear striations stretching from the ciliary body backward through the vitreous and having a broad attachment to the retina, yet not producing any detachment. In several cases after perforating wounds of the sclera with subsequent cicatrization in the vitreous, I have seen the opposite wall of the eyeball drawn in by the membranes, yet without detachment of the retina. I have also found cicatricial membranes in the vitreous, together with detachment of the retina, without any causal connection between the two (Plates I. and II., figs. 6 and 7).

I would not deny, however, that cicatrices in the vitreous may detach the retina. The detachments found with linear cicatrices have, however, for the most part a peculiar con-

formation. They are not rounded, but resemble folds of membrane.

The second objection to the shrinkage theory is the fact that frequently detachment occurs with total fluidification of the vitreous. According to Stellwag such fluidification regularly precedes retinal detachment. Leber and Nordenson found that the striations in the vitreous causing the detachment are frequently not visible with the opthalmoscope, and are only discovered by microscopic examination.

In order to decide as to the importance of this fibrillar degeneration in the production of detachment of the retina, it is necessary that eyes should be examined soon after the detachment has occurred. In one of Nordenson's [1] cases the detachment had existed five years before the enucleation; in one, fifteen months; in one, one year. In one of his cases the detachment had only existed for four to six weeks, and here it might be supposed that conditions resembling those before the detachment would be found. But in this important case no striations were found in the vitreous.

For obtaining topographical relations the freezing method has given me the best results. And when Nordenson by this method found no shrinking of the retina in his Case iv. while in the three other eyes hardened in Müller's fluid this shrinking was found, this difference did not depend upon the hardening method, but rather on the length of time which had elapsed since the detachment occurred. In hardening with Müller's fluid we cannot be sure that the position of the membranes of the eye has not been changed.

Artificial detachment of the retina in animals. Leber, who first presented Nordenson's arguments briefly in Heidelberg in 1882, gave other proofs of the shrinking theory in his work on inflammation. He described a series of experiments on animal eyes, where, after the introduction of pieces of iron, copper, and lead, and after the injection of saline solutions, detachment of the retina was observed. The microscopical examination, after the eyes were hard-

[1] *Die Netzhautablösung*, Bergmann, Wiesbaden, 1887.

ened in Müller's fluid, showed shrinking of the vitreous with rupture and detachment of the retina.

I have repeated Leber's experiments many times. After injection of saline solutions I have obtained detachment, but *rupture of the retina* I have not seen in fresh cases. There was shrinking of the vitreous, but only in reciprocal relation to the projection of the detached retina.

According to my idea the detachment here has occurred by diffusion, either the injected saline solution or the metallic oxide leading to an exchange of fluids. In the eyes of dead animals there can be no detachment, since there is no albuminous fluid present to permit the process taking place.

Leber regards the conditions found in his experiments as caused exclusively by chemical processes, apparently neglecting entirely the fact that diffusion has not only a chemical side but also a physical one.

One series of my experiments was as follows: Animal eyes were enucleated, washed in bichloride solution, then small openings made in the sclera through which the choroid was visible. The saline fluid or foreign body was now introduced, and the eyes were put into specially prepared glasses, the posterior segment lying in an albuminous fluid. The eyes were covered with thymol powder, left five or ten days, then frozen and cut. By observing antiseptic precautions it was possible to prevent decomposition.

Eyes put into the serum without any foreign substance being introduced showed no changes in the retina. The eyes with metallic bodies which were left six days showed simply a swelling of the retina; those left longer showed a more marked swelling, and in some cases shallow detachment.

The eyes into which were injected $\frac{3}{4}$ % saline solution showed simply moderate swelling; with 5 % saline solution, marked swelling and detachment at some points. Thus in dead eyes detachment of the retina was produced in some cases by diffusion between the vitreous contents and the albuminous solution.

Rupture of the retina. The second condition in the pro-

duction of detachment of the retina is, according to Leber and Nordenson, an adhesion between the shrinking vitreous and the retina, and then the rupture.

Rupture of the retina, so far as I know, was first observed by Graefe. De Wecker in 1878 first brought it into connection with the development of detachment. According to Leber, rupture is a *conditio sine qua non* of detachment. In the opthalmoscopic examination of 27 relatively fresh cases he found it positively in 14, doubtful in 5, and wanting in 8. Nordenson reported 48 cases of detachment from Leber's clinic, in 46 of which there was rupture.

Schweigger considered the development of detachment from rupture frequent, but he adhered to the exudation theory.

A rupture of a functionally normal retina, when trauma can be excluded, appears to me *a priori* very improbable. The retina is a membrane relatively thick meshed, but loosely attached to the underlying choroid. It is difficult to conceive of a rupture of the healthy retina by traction from the side of the vitreous.

The detachment of the vitreous from the limitans interna of the retina is produced, according to Iwanow and Leber, by the shrinking of the vitreous. "A shrunken vitreous cannot fill the entire cavity of the ball, and as it retracts it draws the retina after it, or is itself detached"—(Iwanow).

In the first case Leber has demonstrated a preceding adhesion between the shrinking vitreous and the retina.

There is a third possibility, viz.: That the limitans interna is detached by the shrinking vitreous, leaving the retina in position on the choroid. This condition is difficult to explain in accordance with the retraction theory, as it shows that in some circumstances the limitans is more readily detached from the retina than the retina from the choroid. I will not venture to decide whether in such cases the limitans is detached by traction from the side of the vitreous or by osmotic action.

Iwanow has described small vesicles formed by the separation of the limitans interna from the retina, and filled with a structureless mass similar to that commonly found between

choroid and retina in cases of detachment of the latter. I have myself examined a very typical case of detachment of the limitans, in which the retina was everywhere in contact with the choroid, but the limitans, adherent to the vitreous, was separated for long distances.

The eye blind from irido-cyclitis (Fig. 1, Pl. I.) is of normal size. The anterior chamber is filled with a fibro-purulent exudate. The iris shows parenchymatous inflammatory changes. The vitreous is shrunken so that it fills but one third of the cavity of the ball. It consists of a folded gelatinous mass (Fig. 1). From this mass processes extend through the fluid contents of the posterior portion of the chamber, ending in a homogeneous coagulated layer resting on the retina (Fig. 1, *L*). The retina is not detached. Near the posterior pole, however, the limitans interna is detached from the nerve-fibre layer and separated from it on an average 3 *mm.* This space is filled with homogeneous coagulated albumen, and in it may be seen the ends of ruptured Müller's fibres.

Still more interesting is a report by Schweigger[1] of a case in which a band was adherent at each end to the detached retina, and yet the latter showed no rupture.

In another case of my own with detachment of the retina and fibrillar degeneration of the vitreous, the tough bands were adherent to the retina at two opposite points near the æquator, from which they passed toward the posterior capsule of the lens (Fig 7, *a*). At the points where the bands were attached the retina rested on the choroid, but where the retina was detached there were no adherent bands.

The eye was enucleated for irido-cyclitis eighteen months after the penetration of a gun-cap. The eye was blind, and the tension was increased. The ball was hardened with chromic acid and alcohol.

The foreign body lay encapsuled behind the lens (Fig. 6, *c*). No rupture of the retina could be found, and the subretinal fluid, coagulated in the process of hardening (Fig. 6, *c*), took the carmine stain better than the fluid in the vitreous cavity showing a different constitution (*e* and *d*, Fig. 6).

Another case showed a similar condition. An eye blind

[1] *Graefe's Archiv*, vol. iv., p. 199.

from irido-cyclitis was enucleated fourteen days after a perforating injury from a splinter of glass. Beneath the retina was a mass of coagulated albumen. No rupture was found.

These cases speak against the idea of a primary rupture as a cause of detachment. I have followed many cases from the beginning, and Schweigger and Horstmann have described many others, in which at no stage could a rupture be found. The fact that in many cases rupture is found, would seem to indicate that the rupture was a secondary accidental process in a retina already detached.

By many the rupture has been regarded as a secondary process; among others by Graefe, Bowman, and Sichel, who regarded it as being of a remedial nature, and who for this reason practised puncture of the detached retina. Liebreich also held this view, and stated that perforation leads to opacities of the vitreous—an explanation which often holds good, and is of great importance in explaining the process.

Apart from its *rôle* in the production of detachment, how is the rupture of the retina to be explained? According to Leber and Nordenson it is dependent upon the shrinking of the vitreous. The diffusion theory explains it without difficulty. The process of diffusion requires differences in tension before and behind the membrane. These exist also in detachment of the retina. Behind the retina there is a transudation rich in albumen. Before it there is a watery fluid poor in albumen. The process of diffusion may take place quickly, and then the retina as a distended vesicle may be pushed rapidly inward, being elevated by the albuminous fluid transuded from the choroid.

According to the rule the secretion pressure will be higher in the sub-retinal space than in the vitreous chamber, since the law of diffusion through membranes requires that more watery fluid shall pass through the membrane than albumen shall be transuded and displace the membrane. In accord with this, we find usually a diminished tension with detachment and the retina pushed forward and tense. If the retina is too much distended by the sub-retinal fluid, it perforates. The perforation may be favored by bands in

the vitreous, but I have not found any direct observation in support of this supposition.

Schnabel, "Ueber Glaucom und Iridectomie," *Arch. f. Augenheilk.*, 1876, p. 70, was the first to call attention to the deepening of the anterior chamber in rapidly developing detachment of the retina, and he rightly explained it as being due to a sudden diminution of the vitreous fluid. Such a rapid diminution in the volume of the vitreous can be explained by the diffusion process only.

Galezowski, *Recueil d'Opht.*, 1883, who found rupture 131 times in 649 cases of detachment, considered the perforation secondary, as did Boucheron and Ulrich, who regarded the rupture as the consequence of the distension of the retina by the sub-retinal exudation.

Anatomical examination as well as chemical analysis shows a difference between the sub-retinal fluid and that in the vitreous chamber.

An eye enucleated for irido-cyclitis after extraction, and hardened in chromic acid, showed a detachment of the choroid by hemorrhage, and also a detachment of the retina without rupture (Fig 2, Pl. II.). The retina, *d*, is separated from the detached choroid, *c*, by a homogeneous layer of coagulated fluid, which is colored by blood-coloring matter, but contains no blood-corpuscles.

The space between choroid and sclera is stained by alum-carmine a dark brownish-red color, the sub-retinal space, *e*, is reddish-yellow, the vitreous is bluish-violet. The retina is relatively well preserved and shows all its layers.

A system of spaces in the retina. The individual cells of the pigment epithelium are in places separated by clefts. Within the outer nuclear layer and the internuclear layer is a system of spaces similar to the lymph spaces in connective tissue. It is probably these spaces which are represented by the extensive cavities in the freshly detached retina, and these indicate the manner in which the exchange of fluid before and behind the retina takes place. Fig. 3 shows the ganglion-cells, and the inner reticular layer near the vessels *a* and *b*, extending to the inner nuclear layer, *f*. The entire tissue is filled with cavities. Fig. 4 shows at another point,

besides large cavities in the ganglion-cell and inner reticular layers, a system of fairly large cavities in the inner nuclear and the internuclear layers. This system of cavities has not the form and arrangement here described in all eyes with detachment, nor is the condition the same in all portions of the detached retina.

REMARKS IN CONCLUSION.

In what precedes, many points are mentioned which cannot well be explained by the theory that shrinking of the vitreous ruptures the retina and then detaches it. They may all be explained without difficulty by the diffusion theory. By this theory also we may explain the re-attachment with restoration of function which occurs in exceptional cases. When there is a small perforation with sinking down of the detached retina, it is difficult to imagine what force could bring the sub-retinal fluid again into the vitreous chamber, and permit the retina while attached to the shrunken vitreous to re-assume its normal position as must occur if the Leber-Nordenson theory be true.

The process of detachment as explained by the diffusion theory is analogous to the occurrence of œdema or transudation in other portions of the body, and particularly in serous sacs. In the development of œdema, from a physical standpoint there is not only an infiltration but also a diffusion, since these cavities represent the extension in a plane of capillary lymph spaces.

Detachment of the retina occurs more frequently in individuals disposed to œdema than in healthy individuals, as, for example, in cases of nephritis where there is œdema of other organs, and here the detachment is often bilateral. Of particular interest are those cases in which bilateral detachment of the retina occurs simultaneously with œdema of the bulbar conjunctiva, since here it is probable that both conditions are due to a common cause. I saw an instructive case eighteen years ago in a patient with nephritis, in whom there developed simultaneously chemosis of the bulbar conjunctiva and detachment of the retina, and both disappeared together.

The analogy between transudation into serous cavities and detachment of the retina is more striking when we remember the peculiar effect of neoplasms on serous exudations from these surfaces. As we have serous exudation in the pleural cavity with neoplasms there, we also have sub-retinal serous exudation, as a rule, with tumors of the choroid or retina. The difficulty in understanding the development of such an exudation lies in the peculiarity of the contact between the two membranes which are separated by the exudation. The pigment epithelium, which normally is attached to both membranes, is frequently altered in detachment of the retina, and remains on the choroid. The connection between the pigment epithelium and the retina, as late investigations show, is different under different conditions. The processes of the pigment epithelium, which extend in among the outer segments of the rods and cones, advance when the retina is illuminated, and retract when the light is shut off. According to Schwalbe (*Lehrbuch der Anatomie des Auges*, Erlangen, 1887, p. 111), there is a fluid intervening between the epithelium and the rods, that may be of importance in the development of retinal detachment. We may regard this intervening fluid by analogy as lymph representing a lymph space between retina and choroid. We require still further studies in this direction, yet the descriptions of the foregoing cases would seem to speak for the presence of a system of lymph spaces passing transversely through the retina. I shall not allude further to the importance of such a system for the nutrition of the vitreous, and need only say that we have here found the channels through which the vitreous is nourished by the choroidal vessels.

A well preserved detached retina, shown in Fig. 5, confirmed my idea that Schwalbe's sub-retinal lymph spaces play a *rôle* in the production of retinal detachment. At the margins of the detachment, where the retina was still in contact with the pigment epithelium, I found round and angular cavities filled with coagulated albumen among the outer segments of the rods and cones (Fig. 5, *a*).

Near these cavities the elements of the layer of rods and

cones are displaced and detached from the pigment cells. In some parts these spaces communicate through the limitans externa with the larger cavities in the outer nuclear layer (*b*). The cavities here are more round and oval in outline. Under a high power it is seen that the nuclei between the cavities are simply pushed to the side without being compressed. In the inner nuclear layer there is a similar system of large cavities, and also in the nerve-fibre layer, while there are no cavities in the ganglion-cell and the two reticular layers.

Iwanow, in his paper on detachment of the vitreous,[1] says that the retina in the neighborhood of the detachment of the vitreous was infiltrated with a serous fluid. As was stated before, the same system of spaces was found also in the retina of the eyes of animals, when it had been detached artificially by diffusion of an albuminous and a saline fluid. The anatomical examination thus supports the view that detachment is caused in the living by the same or similar processes.

What the chemical change in the fluid vitreous is which so alters the exchange of fluids between the vitreous and the choroid that it leads to serous transudation, cannot be said. We know only that the vitreous becomes fluidified, and that there is a preceding change in the choroid, which probably alters the walls of the vessels so that fluid more readily passes through them.

Besides this, experiments on animals show that the introduction into the vitreous of diffusible substances, such as saline solutions and metallic particles, leads to detachment. The action of these substances in bringing about detachment has been explained by Leber as due to the effect of the phlogogenic substances on distant blood-vessels. This action is spread by diffusion through the tissues, not only along membranes, but in the most direct path.

The phlogogenic influence of metallic oxides in the vitreous, which Leber regards as purely chemical, must, passing in the most direct way through the retina, reach the vessels of the choroid, and here cause an exudation that detaches the

[1] "Beiträge zur Ablösung des Glaskörpers," *Graefe's Archiv*, xv., 2.

retina. Leber has not drawn this conclusion, since he believes that a shrinking of the vitreous produces the detachment. In fact, however, Leber's interpretation of the action of foreign bodies in the vitreous is not so different from my diffusion theory as Leber would have it appear.

The shrinking of the vitreous and the rupture of the retina, according to Leber, cause the detachment. A careful consideration of the diffusion process which plays the chief *rôle* in this shrinking, permits us to recognize the shrinking as a collateral symptom and the rupture as secondary. The mechanical process of detachment of the retina I consider the physical effect of the diffusion, which latter is excited by diffusible materials in the vitreous.

Explanation of the Figures.

FIG. 1.—Horizontal section. *a*, cornea; *b*, lens; *c*, sclera; *d*, choroid; *e*, retina; *f*, vitreous; *g*, bands passing through the sub-retinal space; *h*, deposit on the retina.

FIG. 2.—Horizontal section. *a*, optic nerve; *b*, sclera; *c*, detached choroid; *d*, detached retina; *e*, sub-retinal fluid; *f*, blood extravasation.

FIG. 3.—System of cavities in the inner retinal layers of an ox. *a*, artery; *b*, vein; *c*, perivascular lymph space; *d*, small, *e*, large cavities, forming a network.

FIG. 4.—System of cavities in the nuclear layer of the retina of an ox; 1-7, retinal layers. *a*, cavities in the inner reticular and ganglion-cell layers; *b*, in the inner nuclear and outer reticular layers.

FIG. 5.—System of cavities in a detached human retina; 1-9 layers. *a*, flat space between the layer of rods and cones and the pigment epithelium; *b*, spaces in the outer, *c*, in the inner nuclear layer; *d*, in the nerve-fibre layer.

FIG. 6.—Horizontal section. *a* and *b*, bands in the vitreous; *c*, seat of the foreign body; *d*, sub-vitrinal space, *e*, sub-retinal space, the two spaces differentiated by the different color of the contents.

FIG. 7.—From the specimen shown in Fig. 6, *a*, more highly magnified. *a*, vitreous bands in connection with the retina *b*; *c*, choroid; *d*, vitreous chamber; *e*, sub-retinal space.

FIG. 8.—*a*, detached limitans interna; *b*, retina; *c*, space between limitans and retina; *ch*, choroid; *sc*, sclera.

A CASE OF METASTATIC ADENO-CARCINOMA OF THE CHOROID.

By Dr. V. KAMOCKI, Warsaw.

Translated by Dr. Ward A. Holden.

(*With four figures on Plate III. of Vol. XXVII., Germ. Ed.*)

Several years ago I reported a case which I incorrectly called an adenoma of the choroid. Since then so many cases of metastatic carcinoma have been reported, that I have changed my opinion as to the nature of the tumor, and now wish to describe it more correctly.

March 6, 1884.—I enucleated the right eye of a farmer, aged thirty-seven, on account of an intraocular growth. The patient had always been strong and healthy. One year before, the vision of the right eye began to fail, and for four months had been entirely abolished. The eye was subject to severe attacks of pain, and the patient at once consented to enucleation.

The anterior ciliary veins were injected, the cornea and iris normal, the pupil somewhat dilated. The detached retina, lying on the posterior surface of the lens, was visible to the naked eye. The retina was fixed, and showed no wavy motion with movement of the eye. The reflex from the retina was not of the usual grayish-green color, but was of a much darker, grayish-black hue. The tension was increased. The other eye was normal.

A diagnosis of sarcoma of the choroid in the glaucomatous stage was made.

Macroscopic Examination.—The retina, detached from the ora serrata, rested in its anterior portion on the posterior

surface of the lens and continued back in funnel form to the optic nerve. The ciliary body and anterior portion of the choroid were normal. Surrounding the optic nerve was a tumor, extending partly to the nasal side, having a height of 5 *mm*, and a lateral extent of 18 *mm*, the surface being irregular. In section the tumor showed an alveolar structure, and was sharply limited from the healthy choroid. It was not pigmented. The gross appearance is shown in Figs. 1 and 2, the section in Fig. 2 passing through the nerve, in Fig. 1 being excentric.

Microscopic Examination.—The tumor consists of glandular tissue, in some portions resembling the lachrymal gland, in others the thyroid. All the tubules and cavities were lined with epithelium, which was everywhere sharply limited from the connective-tissue portions, although no distinct limiting membrane existed.

The epithelial cells were mostly cylindrical and arranged in a single stratum.

The peripheric portions of the tumor had a structure like that of an acino-tubular gland (Fig. 3). The curved and branching tubules were lined with flattened epithelial cells, and within the lumen some degenerating epithelial cells were found.

The stroma, consisting of fibrillar tissue, contained numerous stellate, pigmented choroidal cells. The neighboring choroid showed a small-celled infiltration. With the extension of the tumor the choroid had remained passive, its connective-tissue elements simply becoming the stroma of the tumor after being invaded by the epithelial tubules. The lamina vitrea and the pigment epithelium were unaffected.

Preparations from the central portions of the tumor showed a picture resembling that of cystoma of the ovary (Fig. 4). There were cavities lined with a flattened epithelium, and filled with vitreous colloid masses, staining faintly. In these colloid masses were degenerating epithelial cells, leucocytes, and redblood corpuscles.

In some parts the cystic cavities had leaf-like papillary offshoots, lined with a higher cylindrical epithelium. They

resembled the so-called intracanalicular leaf-shaped fibro-anenomata of the mammary gland, or the papillary variety of the cysto-adenomata of the ovary, but were remarkable on account of the slight development of connective-tissue stroma.

Many portions showed transition stages between these two forms. No doubt the collection of colloid substance, formed by the proliferated and degenerated epithelium, is sufficient to explain, by its mechanical effect, the varied configuration of different portions of the tumor.

The stroma, consisting of dense fibrillar tissue with spindle-shaped nuclei and branched pigment cells, seemed to take no part in the degenerative process. The vessel walls were normal. The tubules had also pushed through the optic nerve to its centre.

The remainder of the ball presented nothing abnormal.

According to its histological structure the tumor should be considered a cysto-adenoma. Such a tumor could arise in the choroid, which has no epithelial elements, only by way of metastasis, or through a congenital malformation. My patient being in the best of health, and at that time few cases of metastatic tumor in the choroid having been reported, I was inclined to believe the tumor to have had its origin in a bit of lachrymal gland that by a developmental anomaly had found its way into the choroid. I am now convinced that the case was one of metastatic tumor, although the location of the primary tumor was not found.

The only case in the literature resembling that under consideration, is Gayet's[1] case of carcinoma of the stomach, discovered at the autopsy of a patient from whom an eye had been removed on account of a choroidal tumor which proved to be of glandular structure.

On inquiring, recently, into the further history of my patient, I learned that shortly after leaving the hospital, where he seemed to be entirely well, he began to complain of being ill, and a few weeks later died without medical attention.

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[1] Gayet, *Arch. d'ophtalm.*, vol. ix., 1889.

It seems probable that our patient may have had a carcinoma of the stomach, for the choroidal tumor was very similar to that in Gayet's case, and we know that metastases from carcinoma of the stomach often cause trouble before attention has been called to the original affection.

Description of the Figures.

FIG. 1.—Meridional section of the ball external to the optic nerve. Natural size.

FIG. 2.—Section through the optic nerve. x 2.

FIG. 3.—A peripheric portion of the tumor, bordered by normal choroid, hematoxylin: *a*, pigment epithelium; *b*, chorio-capillaris; *c*, lamina fusca supra-choroidalis; *d*, sclera; *e*, pigmented cells from the stroma of the choroid. x 180.

FIG. 4.—A preparation from the middle of the tumor, stained with carmine. The spindle cells of the connective-tissue stroma are drawn too large. x 110.

METASTATIC CARCINOMA OF THE CHOROID.

By Dr. S. SCHULTZE, Frankfort-on-the-Oder.

Translated by Dr. Ward A. Holden.

(*With one figure in the text.*)

In the last few years a number of cases of metastatic tumor of the eye have been reported. These tumors are located in the choroid or optic nerve. Isolated metastatic tumor of the nerve has been seen but five times, in the majority of cases the choroid being affected. The tumors were carcinoma and sarcoma.

Metastatic sarcoma of the choroid has been diagnosed with certainty twice,[1] carcinoma has been found much oftener.

When I described a case of metastatic carcinoma of the choroid[2] two years ago, six cases had been reported. Since then ten new cases have been observed. This would indicate that metastatic carcinoma is not rare, but that it has often been overlooked.

Abstracts of the cases of Perls, Hirschberg, Uhthoff, Hirschberg-Birnbacher, Manz, Schapringer, Schultze, Ewing, Wadsworth, Gayet, and Mitvalsky (2) may be found in Mitvalsky's paper.[3]

Besides these, cases have been reported by Elschnig,[4]

[1] Brämser, Inaug. Dissert, Berlin, 1870, and these Archives, vol. xiv., p. 185.
[2] These Archives, vol. xix., p. 226.
[3] These Archives, vol. xx., p. 237.
[4] These Archives, vol. xx., p. 370.

Holden,[1] Suende[2] (tumor of right choroid clinically observed only, primary tumor in mamma), and Uhthoff[3] (bilateral tumor of choroid, primary tumor of mamma. Disturbance of vision one month before death).

C. Wagner has recently published a dissertation on metastatic tumors of the choroid.[4] In this he gives a clinical and anatomical description of a tumor of the choroid perforating the sclera, which he regarded as a metastatic carcinoma. The clinical history is against this view, and microscopic preparations of the growth which were sent me showed it to be in all probability a round-celled sarcoma.

There is another case, mentioned by Gayet, which possibly belongs in this category. It was described by Kamocki[5] as an adenoma.

To these sixteen undoubted cases I am now able to add another. The eyeball was enucleated by Professor Schweigger, and with a number of others given me for examination, when the tumor was discovered.

Mrs. S., aged thirty-nine, of tubercular antecedents, was strong and in good health up to August, 1889, when she was under treatment for a subacute catarrh of the lungs. Later there were repeated hemorrhages from the lungs, and cough, although no consolidation of the lung could be discovered, and there was no fever. In December, 1889, the patient had an attack of influenza, and soon after an exudation formed in the right pleural cavity. On puncture 4–5 litres of sero-purulent fluid were removed. There was no fever. In February, 1890, the patient complained that the sight of the left eye was failing, particularly in the centre. In the course of six weeks vision was almost entirely lost, and the eye became painful.

May 5th.—Professor Schweigger found the left eye normal externally, V = p. l. Just behind the lens a vascular membrane, apparently the retina, was seen, nothing else being distinguishable in the interior. A tumor being suspected, and the eye being

[1] These ARCHIVES, vol. xxi., p. 76.
[2] *Recueil d'opht.*, June, 1890.
[3] Internat. Beitr. zur wissensch. Medicin. *Virchow's Festschrift*, vol. ii.
[4] Heidelberg, 1891.
[5] A revised description of the tumor, which the author now believes to be a metastatic carcinoma, is given in the preceding article of this number.

painful, it was enucleated. The hemorrhages from the lungs and the cough continued. There was again an exudation in the pleural cavity which was aspirated. September 2, 1890, the patient died of marasmus, nine months after the first chest symptoms, seven months after the first disturbance of vision, four months after the enucleation. There was never any fever A tumor of the mammæ, uterus, or intestinal canal could be excluded. The liver was not enlarged. There was œdema of the legs, but no ascites.

The attending physician diagnosed a malignant growth in the lungs and pleura, probably with metastases. An autopsy was not permitted.

When the eye was cut after hardening, a thin disc-shaped tumor of the choroid was found, and outside the sclera a nodular growth, which under the microscope was seen to be connected with the choroidal growth (Fig. 1).

The eye is of normal size, and is quite normal in its anterior segment. There is a complete detachment of the retina. The optic nerve and its sheaths are normal. To the temporal side of the nerve the choroid is transformed into a tumor, extending from the nerve to the equator of the ball. The breadth is from 17 to 20 *mm* in all directions. The thickness in the centre of the tumor, where it is greatest, is 3 *mm*. Toward its margins the tumor thins down, and passes over gradually into the normal choroid. The surface is nodular, the consistence firm, the color dark greenish-gray slightly mottled.

A small round tumor on the external surface of the sclera, near the optic nerve, is of lighter color and of firmer consistence than the choroidal tumor. Its lateral diameter

is 6 *mm*, its height 4 *mm*. A narrow tumor mass, passing obliquely through the sclera, unites the two larger foci.

Microscopic Examination. At the margins of the tumor, isolated round groups of cells appear in the middle layers of the choroid, separated by vessels and pigmented choroidal stroma. The inner surface of the tumor is covered with a continuous layer of proliferated pigment epithelium. The outer margin toward the sclera is fairly sharp.

The tumor proper has an alveolar structure, being composed of numerous large and small cell-nests of varying form, separated by the meshes of a fairly dense connective-tissue framework. Among the connective-tissue fibres are many spindle-shaped nuclei, fixed connective-tissue cells, groups of leucocytes, and pigment cells, many of the latter having processes showing them to be choroidal cells.

The nests of carcinoma cells vary in size, as do the epithelial cells themselves, and many nests show hemorrhages in the centre, some of recent date, some old and undergoing degenerative changes.

The small epibulbar tumor consists of a dense connective tissue rich in spindle cells, containing small cell-nests of circular, angular, or elongated form. The epithelial cells are similar to those in the choroidal tumor. No hemorrhages are found in these nests. The connective tissue contains no pigment cells, thus differing from that in the choroid. The tumor-mass, running obliquely through the sclera and uniting the two foci, is composed almost exclusively of epithelial cells, there being but little interstitial tissue. The neighboring sclera contains many small cell-nests. It would seem probable that this connecting tumor-mass had originally been a blood-vessel, although no traces of vessel wall can now be discovered.

The nerve and its sheaths have not been involved by the growth.

In the choroid, no vessels filled with epithelial cells were found, even at the margins of the tumor. In the sclera, many small vessels are seen to be filled with epithelial cells, and a posterior ciliary artery is plugged by a carcinomatous embolus for some distance.

The remainder of the eyeball shows nothing peculiar. The choroid and the detached retina are atrophic.

REMARKS.

This case was one of the rarer forms, only four cases having been reported, of circumscribed disc-like metastatic carcinoma of the choroid; the more frequent form being a flat carcinomatous degeneration of the entire choroid. The greatest thickness of the tumor was near its centre, corresponding to the entrance of the short ciliary arteries. This is the part that has been found thickest in most of the cases reported, from which we conclude that this was the point where the primary embolus was deposited. As was stated before, an artery in the sclera was found to be plugged with carcinoma cells. The fact that in most of the cases no plugging of an artery is found may be explained by the primary emboli lodging in the capillaries of the choroid, as in the cases of Perls and Holden. In the late stages, these primary emboli may not be recognized in the mass of the tumor.

This case is of interest since the primary carcinoma was not in the mammary gland as in most cases, but in the pleura.

Perforation of the sclera has been seen twice before. In Uhthoff's second case there were large retrobulbar nodules in direct connection with the choroidal foci and also an invasion of the optic nerve, so that the choroidal affection was small in comparison with the retrobulbar. In my first case I found a beginning perforation. The carcinomatous masses had replaced the sclera to a considerable extent, and had formed a flat prominence on the outer surface of the ball, that in life had been taken for an episcleritis. Between these two cases stands the new case where a localized epibulbar tumor, scirrhus in structure, is connected by a narrow process with the more extensive choroidal growth. The typical carcinomatous structure of the epibulbar tumor is the best proof that the choroidal tumor is carcinomatous and not an alveolar sarcoma.

Of the cases reported, six were bilateral, and ten unilateral. Of the latter, seven were of the left eye, two of the right, the other case not being fully reported in the reference at my disposal.

The predominance of the disease in the left eye is probably due to the fact that the left common carotid arises from the aorta before the right common carotid and at a less acute angle. Thus embolism of the middle cerebral artery is more frequent on the left side.

Manz and Wagner explained the frequent bilateral occurrence of the disease by an emigration of carcinoma cells from the first eye to the second by way of the lymph sheaths of the optic nerve. It is more probable that the tumor arises in both eyes by metastasis. This view is supported by the fact that the tumor always appears in analogous regions of the eye, and in that portion where the ciliary arteries enter and give off branches. In case there was a transmission through the optic nerves, the first appearance in the second eye would be a carcinomatous papillitis, which has not been seen. Furthermore, in two cases, both eyes were affected simultaneously. And if such a transmission of cells were possible, we should certainly have it in sarcoma, which not infrequently affects the optic nerve, but which has not been known to reach the second eye through this channel.

We must conclude that in bilateral cases there are capillary or larger embolisms in the region of the posterior ciliary arteries in each eye. Bilateral carcinomatous metastasis in other organs is not rare, Uhthoff's second case having bilateral nodules in the cerebrum and in the ovaries.

The hemorrhages in the interior of the cell-nests seem to be the initial stage of the necrosis within the alveoli that Mitvalsky has described at great length. The necrotic portions in Mitvalsky's drawings always occupy the centre of the alveoli and often extend to the connective-tissue framework. There is no proof that carcinoma cells later surround these old hemorrhages, as Mitvalsky supposes, and even in fresh hemorrhages I was often able to find carcinoma cells which may have been torn off and swept away by the blood current. Quite different from these are the extensive necrotic

patches in the tissue, found in my first case and Uhthoff's last, which were simply large portions of the tumor, connective tissue as well as cells, that had lost their vitality and into which hemorrhage may have taken place.

Whether the hemorrhage causes the necrosis, or the necrosis the hemorrhage, cannot be determined. In my preparation hemorrhage was found without necrosis, but in no case has there been found necrosis without hemorrhage. Therefore, it seems proper to consider the hemorrhage primary and the necrosis secondary.

The marked difference in the structure of the intraocular and the epibulbar tumor, the latter presenting the typical picture of scirrhus, while the former resembled more a medullary carcinoma, was no doubt due to the difference in structure of the tissues in which the carcinoma cells developed. This difference, in two tumors evidently connected and having a common origin, seems particularly noteworthy.

A TRIPLE ROTARY VARIABLE PRISM.

By EDWARD JACKSON, M.D.,

PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA POLYCLINIC, SURGEON TO WILLS EYE HOSPITAL.

IN exhibiting a combination of the rotary prism and rod test before the late meeting of the American Medical Association, I suggested that the same principle might be applied to the ordinary rotary prism. Since then the suggestion has been carried out by Messrs. Bonschur and Holmes, of Philadelphia, in a neat instrument, which is fitted to use in the ordinary trial frame and illustrated in the accompanying figure.

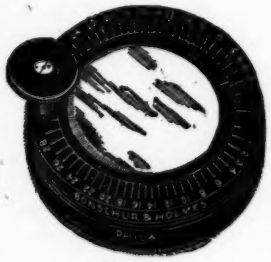

FIG. 1.

The action of a prism turned in any direction may be replaced by equivalent component prismatic actions in the vertical and horizontal directions; and as the prism is turned the one component equivalent increases and the other diminishes. In Fig. 2, suppose AB to represent the action of the prism placed with its edge and base vertical,

acting horizontally. When the prism is rotated so that it acts in the direction AC its effect is equivalent to the combination of a prismatic effect AD acting horizontally with a prismatic effect DC in the vertical direction. As the prism is rotated DC increases with the sine of the angle CAB and DA diminishes with the cosine of the same angle.

The rotary variable prism is constructed in such a way that two prisms of equal strength shall be equally rotated in opposite directions. As this goes on, one component of one prism exactly neutralizes the corresponding component of the other prism, while their remaining components act together and give the variable effect.

The forms of rotary prism heretofore used, as the Crétés and Risley prisms, or the prisms of Prince's phorometer,

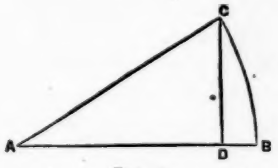

FIG. 2.

have been so arranged that the components which diminished with the cosine of the angle neutralized each other, while the components that increased with the sine of the angle gave the variable effect.

The objection to this is that the sine of the angle increases rapidly at first and more slowly as the maximum effect is approached, so that with such a prism it was impossible to control with exact accuracy the weaker prismatic effects. A very slight rotation of the prism caused the variable effect to run up to two or more degrees, while as the maximum of prismatic power was approached the increase became very slow.

In this instrument I have had the prisms arranged so that it is the components increasing with the sine of the angle which neutralize each other; and the components diminishing with the cosine of the angle which are available for use.

To effect this it is necessary that the rotary prisms start from the position in which they act together, producing their maximum effect, which maximum effect must be exactly neutralized by an equivalent third prism.

As the rotary prisms proceed from this position, their effect diminishes with the cosine of the angle, and by so much leaves the third or fixed prism unneutralized to produce an increasing prismatic effect. This effect is at first very slight, but the increase is progressively more rapid until the rotary prisms have each passed through 90°, and are made to neutralize each other when the whole effect of the fixed prism becomes available.

Continuing the movement of the rotary prisms, they begin to produce an effect in the same direction as the fixed prism, which effect increases now more slowly until after passing through 180° the maximum effect of the rotary prisms is added to that of the fixed prism. In this way, by employing rotary prisms of 7.5 centrads each, and a fixed prism of 15 centrads, any effect is produced from zero up to 30 centrads. The delicacy of the instrument for producing slight prismatic effects may be judged by the fact that the rotary prisms must each be turned through nine degrees to produce the first quarter centrad of prismatic effect.

The graduations shown in the figure are each a whole centrad to thirty, except the first which gives the one-half centrad. No one who has worked with a rotary prism would be inclined to discard it for any other instrument; and the increased exactness that this form gives for the slight deviations which are present in the larger proportion of cases, increases enormously its usefulness.

RUPTURE OF THE RETINA (SEPARATION OF A RADIAL STRIP OF THE RETINA) IN A CASE OF CONNECTIVE TISSUE NEW FORMATION OF THE VITREOUS AND RETINA (RETINITIS PROLIFERANS—MANZ).

By Dr. THEODOR AXENFELD,

FIRST ASSISTANT AT THE UNIVERSITY EYE CLINIC AT MARBURG.

Translated by Dr. J. M. Mills, of New York.

(*With Plate IV. (colored) of Vol. XXVI. Germ. Ed.*)

THE following case, which Prof. Uhthoff has kindly permitted me to publish, was presented by him to the Marburg Medical Society on July 6, 1892.

History as follows:

Mrs. G., æt. thirty-three years, had scarlet fever in 1864—otherwise well. Is the mother of four children, of which two died of diphtheria. In 1889 suffered with an inflammation of the right eye, which lasted six months without having produced any permanent impairment of vision. At that time the patient noticed that she saw less distinctly on the left and in the middle, and at times a distinct gray point appeared here. This remained unchanged until the winter of 1891, and then the sight improved in the left eye and attained its present condition; but in the meantime she observed the following phenomenon: When she looks with her left eye toward the left and into the light, there appears temporally "a small, dark fly," from which a gray transparent fibre extends in a gentle curve, outwardly and above. This gradually widens and then disappears below, at the extreme limit of the field. It has the appearance of "a fish darting through the water."

The patient also states that there seems to be a cobweb on each side of this fibre. She noticed these symptoms for the first time while she was hanging out some exceedingly white washing.

The right eye remained well after the cessation of the inflammation referred to, until November, 1891, then the patient noticed that at times, in the morning, everything appeared dark above the eye, as if some pressure was exerted there. Last November, early in the morning, "it was as if there were thick clouds above," which soon after contracted and seemed "like a dense shadow," that appeared just where she wished to look and turned like a coil. At times she saw better. These thick flakes gradually became thinner and finally, *i. e.*, within three weeks, contracted to a small thread that moved and trembled considerably; often it grew wider and concealed everything. Her vision improved again, but on Christmas Day, 1891, suddenly a fresh mist gathered before the eye, in which dark and white spots moved; soon the cloud took on a dark-green color. After the sight had again temporarily improved, during the formation of flakes, in March, 1892, there was a glittering sensation and it grew quite dark from above; and as the "darkness" increased, the flakes became less distinct, so that at present they are entirely invisible. Since then, at twilight, there is complete blindness.

Stat. præs., July 21, 1892.—Medium-sized, strong, not anæmic person, without any disease of the other organs. Urine normal. Eyes externally normal.

Left Eye.—(See plate IV., colored drawing.) Media clear, except the nasal periphery of the vitreous. There are no floating opacities.

Ophthalmoscopic.—Disc is red, the external margin is covered by a white spherical, partly pigmented mass, which projects 1.5 D above the plane of the retina and in part rests upon the nerve. In the direct image several delicate new-formed vessels can be seen on this nodule. Adjoining is a small spot of the same color. The retina, in the neighborhood of the disc, is cloudy, the vessels, in parts, very much veiled, though not enlarged. On the inner side of the disc, opposite to the white nodule, begins a long-stretched atrophic patch of the choroid with markedly hilly pigmentation. It takes a radial course inwards and somewhat downwards, extending to the periphery. At the utmost it attains a width of $1\frac{1}{2}$ disc-diameter. Right under this atrophic choroidal ridge, about 2 discs distance from the nerve, a large retinal artery,

with its accompanying vein, emerges from the clouded retina, and can with difficulty be followed to the disc. These vessels take the same direction as the chorio-retinal scar and anterior to the same (in the direction of the vitreous), toward the lower and inner part of the retina.

But a short distance off the retina containing the two vessels is raised in the form of a very narrow, steep, grayish-green, radial fold, upon whose summit the vessels pursue their course. This retinal fold becomes steeper and narrower, like a wall, until gradually the crest, with its two vessels, detaches itself from the side-walls and runs free into the vitreous as a thin linear strand.

By means of the parallax a part of the adjoining normal background can be moved between the strand bearing the vessel and the choroidal atrophic portion that commonly lies behind it. In their course through the vitreous this pair of vessels are partly covered by a radially directed greenish-white, shining membrane, which connects with the fold, that is to say, with the cord, and does not float ; finally the vessels end in a large tendinous mass, which at the extreme periphery seems to be again connected with the retina by numerous cobweb-like filaments, but which cannot be sharply defined. The refraction of the vessels at the detached portion of the cord is + 4 D, but at their entrance into the white and more prominent elevation + 12 D, with emmetropic surroundings. (The ophthalmoscopic drawing shows the condition in parallactic displacement. By exact focussing of the lens the vessels appear to lie before the pigmented spot.) There are also a number of small bright atrophic spots in different portions of the choroid

E, S = $\frac{6}{16}$. The field of vision shows a slight enlargement of the blind spot and proceeding from this a very small radial zone in which punctiform objects appear darker, and with less illumination disappear entirely.

Right Eye : There are numerous large floating opacities in the lower and inner part of the vitreous. They lie mostly in front of the retina and in parts are blood-colored. The disc is indistinctly visible and that only in the upper margin, otherwise very much veiled. A very large hemispherical detachment of the entire lower half and lateral portions of the retina above it is still in position. In the grayish-white, very cloudy detached retina there are very intense, sinewy reflecting, irregular, and uneven places, with radiating processes. In the lower part are numerous

very large, flattened, fresh retinal hemorrhages between these white masses. These latter do not resemble the true folds but resemble the radiating irregular hypertrophic scars as seen after burns of the skin, and possess bulky new-formed vessels, running in different directions. A similar larger thickening lies in front of the still adherent retina; just above the disc and projects 5 D to 6 D above the surrounding parts. A shining greenish-white mass raises itself from below and, passing above the disc, juts out, like a steep eminence, free into the vitreous. It is connected with the detached retina by numerous tendinous processes and from its apex fine sinewy threads are drawn up, like a garland, to the larger nodule. This rounded projection shows a peculiarly delicate anastomosing vascularization that can only be exactly differentiated by the direct examination with a very strong convex-glass. Between the tendinous masses the retina is folded very irregularly. Deep excavations alternate with steep elevations that radiate around the different connective-tissue nodules. The true vessels of the retina run everywhere under the proliferations. In some places, on account of the irregular formation of the folds, they come very close together, approach very close to each other, and build a regular convolution with the new-formed vessels. Besides this there are above and in the neighborhood of the large prominences, extensive atrophic patches in the choroid with considerable pigmentation.

V = Fingers in 4 *m*. Nearly the entire upper field is defective and there is pronounced torpor of the retina. *And yet there is no anomaly of the field corresponding to the large mass that lies above the disc and anterior to the still adhereut retina. Also colors, i. e., red and green, are recognized.*

During a six weeks inunction treatment followed by potass. iodid. the condition remained unchanged.

We have observed, as also many others, extensive retinal changes near the fresh hemorrhages and their remains; further, it has been pointed out that the impairment of sight was relatively small in comparison to the visible anomalies. In the right eye the relapsing hemorrhages undoubtedly played an important part. And also in the left eye, where, at the time, no fresh hemorrhages were found, nor even any distinct remains, at least in the common form, and the history is not definite, still, it appears to me, they must

have previously occurred in order to explain the peculiar condition.

A glance at the drawing shows that the vessels in the detached cords, which we have described, are not new-formed. It is more likely an isolated detachment of a small strip of the retina, bearing a pair of vessels and extending in the direction of the vitreous. Otherwise, how could it be explained?

The white shining masses represent, undoubtedly, connective-tissue membranes and are evidently in causative connection with the detachment. It is after all very likely that an extensive and quite pronounced hemorrhage of the vitreous took place from the pair of vessels which are now raised, but primarily there was no detachment of the retina; this hemorrhage became organized and in its gradual contraction drew the attached vessels with the adjoining tissues, ridge-like, away from out the retina. At first, as a narrow fold, which atrophied, *i. e.*, tore in the anterior half where it was more subjected to the traction. Whilst this occurred, in the immediate neighborhood a firm adhesion took place between the choroid and the retina, presenting the same appearance as the ledge-like pigmentations that surround the borders of an old detachment of the retina which has come to a standstill.

TWO CASES OF ELECTRICAL FLASHING FOLLOWED BY SEVERE RETINAL IRRITATION AND INTENSE EYE-PAIN.

By L. D. BROSE, M.D., Ph.D.,

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DURING the past year two cases of eye injury, resulting from electrical flashes, were reported in one of the English journals and commented upon as a new source of eye disease. It has been my experience to meet with two additional cases, produced in a similar way, with the same symptomatology and running about the same course.

The first patient, J. H., æt. twenty-eight years, and an employé of the Evansville Electrical Street Railway, on the night of July 31, 1893, while preparing a car for leaving the power-house, and after interrupting the overhead trolley from a live circuit, had occasion to leave his work and look after something else in another part of the building. Returning, he did not notice whether the trolley was still interrupted, but thrust the blade of a screw-driver, which he held in the right hand by the wooden handle, into the motor cylinder, when immediately he was flashed by a powerful light and stunned for a few moments by the powerful current. Upon recovering his senses the eyes pained him, but not bad enough to unfit him for work. In a few hours, however, the pain increased, then became so intense that he was obliged to go home. When I first saw him, some five hours after the accident, the eyelids were tightly closed and the facial expression that of one suffering great pain. Opening the lids gently with the fingers, the conjunctival blood-vessels were found injected, the eyes suffused with tears, and the pupils contracted. None of the tissues were burned or injured, and, so far as could be ascer-

tained through superficial counting of the fingers, vision was not impaired. Treatment: The patient was directed to remain in a darkened room, given two doses, each of eight grains, of antipyrene, and eye instillations every three to four hours of a 2 per cent. solution of cocaine. Within twenty-four hours the pain disappeared and the man resumed work upon the following day.

Frank W., single, æt. twenty-four years, an employé of the Street Railway Company, on the night of Oct. 7, 1893, while working in the power-house, struck a live electrical circuit with a steel file which he held in the right hand. Instantly there was a flash of light and the man was at once rendered unconscious. Upon regaining his senses he complained of violent pain in his eyes and was unable to remain at work. I saw him within a few hours after the injury and found the left eyelashes singed, the patient with a burned hand and complaining of great pain in the eyes, little influenced by darkening the room or closing the eyelids. Gently opening the eyelids, the eyes were found congested, with contracted pupils, but otherwise uninjured, and so far as could be ascertained vision was good. The steel file with which the circuit had been struck was badly burned and mutilated at the point of contact. Patient was treated by cocaine instillations. confinement to a darkened room, and internally a few doses of opium. During the two succeeding days his suffering became less and less, and by the fifth day he again took up his work. As soon as the condition of the patients would admit of it, and during the continuance of the eye-pains, an indirect ophthalmoscopic examination was made of the eyes, but nothing abnormal detected except an undue fulness of the blood-vessels of the fundus.

A CASE OF RARE AND FATAL DISEASE OF INFANCY WITH SYMMETRICAL CHANGES IN THE YELLOW SPOT.

By CURTIS B. CARTER, M.D.,

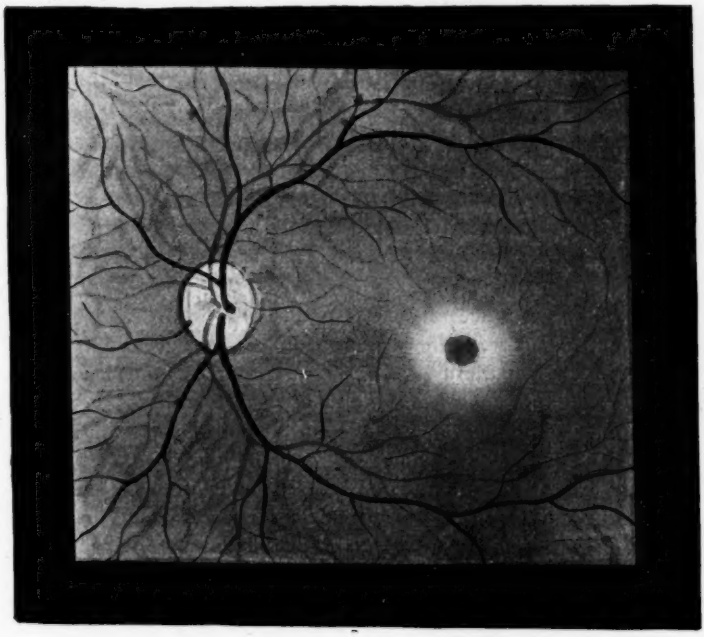
ASSISTANT SURGEON N. Y. OPHTHALMIC AND AURAL INSTITUTE.

(*With an ophthalmoscopic drawing.*)

BEFORE giving a résumé of the cases previously reported, I shall give a brief description of the clinical symptoms, accompanied by an ophthalmoscopic picture, of the patient who came under my own observation.

L. Trockman, æt. nineteen months, daughter of Hebrew parents, was seen by me on December 7, 1893 at the New York Ophthalmic and Aural Institute, and the following clinical history was obtained. Patient healthy up to the third month; since then a gradually increasing general weakness without paralysis. The child is apathetic; cannot hold up head or sit up; moves limbs slowly; nearly every hour during the last nine months child has tonic contraction of muscles of neck and limbs. Child fairly well nourished, was nursed from the breast only three months, then fed on condensed milk, lately on cow's milk. Flesh and skin soft to the touch. Hearing good. Eyes externally normal, mobility and pupillary reaction normal. Eyes do not follow light. Ophthalmoscope shows both discs pale, sharply outlined, retinal vessels normal. At the macula of both eyes were found changes resembling those following embolism: a cherry-red spot sharply defined, surrounded by a grayish-white halo not sharply outlined, a little larger than the disc, and apparently horizontally oval in form. Both parents are second cousins, both previously healthy with no specific history. Have been married four years.

Had a female child before this one, which died at the age of seven months after an illness of one week with spasms. One of the grandparents died of phthisis. On the 15th of January, 1894, I had an opportunity of examining the child again. The clinical features remained about the same as above recorded except that the discs of both eyes had undergone total atrophy. The child died on the 21st of January. An autopsy was not obtained.



I shall briefly review the literature on this rare disease. In April, 1881, Warren Tay, of England, reported (*Trans. of the Ophthalmic Society of the United Kingdom*, vol. i.) the first case of this then unknown malady. It was in an infant aged twelve months. The ophthalmoscope showed the above characteristic changes. Since then he has reported three other cases (*Trans. Ophth. Soc.*, vol. iv., p. 158 and vol. xii., p. 125). Tay having called attention to the disease, other ophthalmic surgeons over the world were not long in dis-

covering other similar cases. Goldzieher of Buda-Pesth (*Hirschberg's Centralblatt*, 1885) described a case, which died shortly after observation. No age given and no autopsy. No history of syphilis, though the mother had four previous miscarriages. Magnus of Breslau (*Zehender's Klin. Monatsbl.*, 1885, vol. xxiii., p. 42): A female infant, aged one and a half years. Parents healthy. Child unable to hold up head or sit without support. Head normal size, hearing normal; never had convulsions. Could not fix objects with eyes. Pupils normal in size but sluggish in action. External muscles of eyes normal. Optic disc has a yellow tint, not pale like atrophy. Retinal vessels normal. Yellow spot presented an "intense milky whiteness"; "at the centre of the macula is the well known appearance of the cherry-red spot." The above appearance is symmetrical in both eyes. Since the above recorded case Dr. Magnus has seen another.

Dr. H. Knapp reported a case in the *Trans. of the Heidelberg Ophthal. Soc.*, 1885 (supplemented *Tr. Heidelberg Congress*, 1888). Four months after birth the child (first child, girl, of healthy Jewish parents) was first seen; it improved in general health for a few months and then rapidly sank and died at two years of age. This was the first case upon which an autopsy was held, namely, by the family physician, Dr. B. Sachs, who gave an account of it in the *Journ. of Nerv. and Mental Diseases*, New York, Sept., 1887. The chief pathological changes found were, atrophy of the cerebral convolutions, with marked alterations in the shape of the large and small pyramidal cells of the cortex. Eyes and spinal cord were not examined.

Hirschberg of Berlin published (*Centralblatt f. Augenheilk.*, 1888) an account of a first-born child seen in February, 1886. Child looks feeble, had rachitis, no syphilitic history. Eyes follow light, pupillary reaction normal. Optic discs normal. "One sees around the red spot at the centre of the retina an intensely discolored bluish-gray zone, $\frac{1}{4}$ *mm* in width, which gradually fades toward the periphery. Saw child for the last time October 13, 1886; it was sickly and pale. Optic discs were paler, and child apparently blind. Ultimate result was not known.

Wadsworth (*Trans. of the American Ophthalmic Soc.*, 1887, vol. iv.) of Boston gives the full history of the general symptoms occurring in a Jewish female child aged eleven months. Child well nourished, but unable to sit up or hold up head. Head well formed. Eyes externally normal, mobility good, pupils faintly active. Vision very imperfect. On account of child's fixing the light it was impossible to obtain a good view of the disc; from the "floating view obtained" they were grayish, with normal vessels; at the macula was a dark red spot surrounded by a "whitish evenly-tinted zone." Both eyes were alike. Child was seen for the last time on June 30th; the ophthalmic changes were about the same except the eyes did not fix the light as formerly. The mother of the patient had given birth to five children before this one, the first four were strong and healthy; the fifth one died at the age of eighteen months.

Kingdon (*Trans. Ophth. Soc. Un. K.*, vol. xii., p. 126) reports a case in a Jewish boy, aged eight months, who had been brought to the hospital on account of general weakness of back and limbs. Child's head normal. Moves limbs feebly with scarcely any power in the muscles of back and neck. Hearing normal. Ocular muscles normal. Pupils normal in size and movement. "Media clear, optic disc pale yellowish-white color." Arteries of the retina are diminished in size. "At the yellow spot covering a space nearly twice the size of the optic papilla, is a whitish-gray patch somewhat oval in shape (axis being horizontal) with softened edges; a few retinal vessels are visible on it at the periphery. In the centre of the patch the fovea centralis is of a dark cherry-red color, reminding one of the appearance seen in retinal embolism." This child died at about the age of one year and an autopsy was held; thus Mr. Kingdon was the second and last ophthalmic surgeon to obtain a post-mortem. The principal pathological conditions found were marked changes in the pyramidal cells of the cortex. The eyes were examined by Mr. Treacher Collins, but unfortunately there was a fold of the retina at both maculæ. No pathological changes were found in the eyes except in the retina; "the outer molecular layer seemed spaced out and enlarged,

as though possibly there had been some localized œdema in this region." It would seem, from the little that we know of this rare disease and its pathology, that it was as Dr. Sachs thinks, rather arrested cerebral development than non-development as the result of previous inflammation, and Mr. Kingdon is also of this same opinion.

The case which I here report agrees well with the other cases described, excepting that in many there was no consanguinity and in some no spasms. Most of the cases have occurred in Hebrews. All cases followed, have been found to terminate fatally.

Dr. Knapp informs me that the parents of his patient had two more children, a boy of five years who is bright and the picture of health, and a girl, the exact counterpart of her older sister. She was blind, weak in back, apathetic, and died from exhaustion, æt. eighteen months.

A review of the cases published thus far is appended to the communication of E. C. Kingdon in the *Trans. Ophth. Soc. United Kingdom*, vol. xii., p. 126.

STUDIES IN THE PATHOLOGY OF THE OPTIC NERVE.

By Dr. THEODORE SACHS, of Innsbruck.

I.—CONSTRICTION OF THE OPTIC NERVES BY VESSELS AT THE BASE OF THE BRAIN.

(With four figures on Plates V. and VI. of Vol. XXVI., Germ. Ed.)

Translated and condensed by Dr. J. A. Spalding, Portland, Me.

IT is forty years since Tuerk, in a paper on compression of the optic nerves,[1] communicated a case in which the autopsy verified a condition of the nerves and vessels similar to that of the title of this article. The chiasma in a woman blind in the left eye and partially so in the right had been flattened and thrust aside by a tumor arising from the sella turcica, so that the optic nerves had been pressed against the anterior cerebral arteries.

The vessels, made tense by the tumor, to which fact Leber later called attention,[2] had compressed the soft nerve substance in such a way that, on the left side, the connective-tissue sheath alone remained, whilst on the right side the inner third of the nerve had escaped constriction.

The literature of these tumors, since published, contains no mention of a condition similar to that of Tuerk, although the chiasma and optic nerves are almost always involved by compression in similar cases.

Klebs's statistics [3] of 3622 autopsies show 64 cases of tumor of the brain, of which 4 were at the hypophysis.

[1] *Zeitsch. d. k. k. Gesell. z. Wien*, Band viii., p. 299.
[2] *Graefe-Saemisch*, Band v., p. 841.
[3] *Prager Zeitsch. f. Heilkde.*, Band cxxxiii.

In addition to 38 autopsies of similar tumors reported by Rath,[1] I am now able to add 9 from further literature on this topic,[2] and thus to show that out of 48 tumors of the hypophysis, only 2 led to constriction of the optic nerves by the anterior cerebral arteries.

Bernheimer has called attention to the fact that Tuerk's case cannot be compared with the circumscribed pressure atrophy which he has seen with enlarged and sclerotic vessels at the base of the brain.[3]

We may also refer to a case seen by Mackenzie,[4] of a blind woman dying of apoplexy. All the nerves but the optic nerves were apparently normal. The latter had no medulla. The cerebral arteries were much altered, covered with spots, and more resistent than normal. Both carotids, near the optic nerves, were enlarged, and suggested the possibility that this had produced the alterations in the optic nerves.

Mackenzie also speaks of Ware's suggestion that compression might arise from Willis's circle, and adds a case from Spurgin, in which a small aneurism of the right anterior cerebral artery had pressed upon the right optic nerve of a cataractous eye, then opened into the lateral ventricle and produced sudden death.

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[1] *Inaug. Dissert.*, Goettingen, 1888. Compare *Archiv f. Ophthal.*, Band xxxii., p. 81.

[2] *a.* Hay, in Abercrombie's *Diseases of the Brain.* Referred to in Mackenzie's *Practical Treatise*, 1832, p. 797.

b. Stilling, in *v. Ammon's Zeitsch.*, Band iii., p. 465. Referred to in Arlt, *Augenkrankheiten*, Band iii., p. 150.

c. Nevermann, in *v. Ammon's Zeitsch.*, Band v., p. 366. Referred to in Arlt, iii., p. 165.

d. Tuerk, *l. c.*

e. Mueller, D. L., *Archiv f. Ophthal.*, Band viii., p. 160.

f. Ripping, *Allgem. Zeitsch. f. Psych.*, Band xxx., p. 119. Referred to in Wilbrand, *Hemianopsie*, p. 70.

g. Blessig, *St. Petersburger Med. Zeitsch.*, Band x., 1866. Cited in *Centralbl. f. d. Med. Wiss.*, 1866, p. 343.

h. Hippel, *Virchow's Archiv*, Band cxxvi., part 1, p. 124.

i. White, *Brit. Med. Jour.*, 1884, vol. i., p. 282. Cited in Michel, "Krankheiten d. Auges i. Kindesalter" (*Gerhardt's Handbuch*, 5/2, p. 519).

In the two cases of hypophysis-tumor in Immermann's "Inaugural Dissertation," Bern, 1889, no attention was paid to the condition of the optic nerves.

In a narrower sense, cystic tumors of this region might produce similar compression. Langer, *Prager Zeitsch. f. Heilknde.*, Band xiii., p. 57.

[3] *Archiv f. Ophthal.*, Band xxxvii., part ii., p. 37.

[4] *Practical Treatise*, 1832, p. 793.

Finally, Schmindler of Freiburg asserts that an aneurism of the central retinal artery destroyed the lower visual fields in a patient under his care.

The case which I now beg to report is as follows:

Mrs. M., æt. twenty-six, came to the hospital for operation on an abdominal tumor. As she made no complaint of loss of sight, the eyes were not examined, though the autopsy proved that, if not totally destroyed, the vision must have been greatly reduced.

Autopsy soon after death.

Lying over the sella turcica is a rounded tumor, 3 *cm* high, with the adjacent optic nerves not only much displaced but apparently completely constricted in the middle of their course by the arteries running diagonally across them. The chiasma is also completely flattened.

Anatomical diagnosis: Death after laparotomy, metastasis into the peritoneal glands, and hypophyses. Anæmia.

The specimen after remaining a year in Mueller's solution, is well shown in Fig. 1, Plate IV., the nerves and eyeballs having been previously removed.

The tumor has pressed in between the branches of the optic nerve, and hangs backward over the edge of the sella. The upper surface shows a post-mortem rupture, through which the cyst-like cavity is visible. The escape of the contents has reduced the prominence of the tumor quite considerably. The chiasma has been pushed backward and upward, but is not attached to the growth. The optic nerves are elongated, flattened, and separated to such an extent, that the right nerve lies at the bifurcation of the artery of the corpus callosum from the internal carotid. The same is seen on the left side, but it has been apparently so altered by the evacuation of the tumor, that the constriction is now less than actually existed during life. The inner edges of the nerves lie 17 *mm* apart.

The upper surface of the right nerve bears marks of a constriction, 1 to 3 *mm* wide, running obliquely across, and containing the anterior cerebral artery. The external end of the furrow corresponds to the origin of the artery from the cerebral carotid, and lies close to the chiasma. Directly behind, the nerve widens and grows thinner.

On the left side the anterior margin alone of the furrow is well defined, but it runs symmetrically with the furrow in the other nerve.

The relation of the constriction to the arteries is undoubtedly the same on the left sides as the on right, and only differs in appearance owing to the above-mentioned alterations. The constriction of the left nerve is so complete that, on the outer margin, nothing remains but the pial sheath, in the form of a narrow band, which only regains a medulla farther on, and then widens and finally reaches the chiasma. The latter is flattened into a plate 24 *mm* by 10 *mm*, and has lost all resemblance to the normal state. The flattening has consequently resulted in an extreme thinning in the middle to 1 *mm*, and behind to 2 *mm*.

The specimen was hardened in alcohol, imbedded in celloidin, and various sections made to show the alterations to the best advantage. The coloring was first done with the Weigert-Flesch method,[1] then with hæmatoxyline-eosine, carmine, cochineal, alum, and nigrosine. We thus recognize the various steps of degeneration, whether in fibrillæ, globules, or myeline dust. Moreover, the chemical degeneration of the medulla is made visible, and tinted even in balsam preparations. Finally, from the intensity of the non-degenerated fibres, we get an idea of the chemical integrity of the medulla.

Examination of glycerine sections showed degeneration of a few symmetrical groups of nerve-fibre bundles, the right nerve being more affected than the left.

Under low powers the right nerves showed the following changes :

Optic papilla deeply, but not totally, excavated.

Close behind the globe lie bundles of atrophy from the vessels to the sheath, occupying two fifths of the nerve, those next the sheath being most affected.

Two *mm* behind the lamina, an atrophic segment lies outside the vessels, beyond this another less defined, and a strip toward the inner upper periphery, all amounting to one half of the nerve substance.

Just before the entrance of the central vessels the atrophy is sickle-shaped, with the upper prong extending to the periphery of the nerve.

The atrophy at the orbital end of the optic canal is retort-

[1] *Zeitsch. f. Wiss. Mikros.*, Band i., p. 564. The sections are placed in a 0.5 per cent. solution of chromic acid, then in Weigert's non-alkaline hæmatoxyline solution, and finally differentiated by a borated-ferrid-cyanid-alum solution. In order to avoid errors the sections remained a day in each solution. The nerve medulla was tinted an intense black, the other tissues and the degenerated patches, yellow to brown.

shaped, the body lying in the lower periphery, the neck in the upper.

The degeneration at the intracranial end of the canal resembles a hook with the long arm down.

The atrophy at the foramen opticum is total in the margin, though a few *mm* onward it disappears, and does not extend into the canal. This localization at the margin is probably due to pressure against the bony margin of the foramen.

Three *mm* beyond the foramen the cross-section changes into an oval with rounded point, the atrophy lying in the point, and amounting to one third of the substance.

The lateral edge of the section directly in front of the constriction exhibits a narrow strip of pressure atrophy (from the internal carotid), but the most remarkable feature is the extreme flattening of the nerve to 2 *mm* in thickness, and 6 *mm* in width.

Longitudinal sections at the constriction show the margin at the distal portion sharpened on the inner side and rounded on the outer. The inner margin contains almost exclusively non-medullated fibres, and as we pass to the outer side the medulla constantly darkens in tint. This discoloration does not extend to the margin of the constriction, but is separated from it by what we may call a "cicatrix."

The margin in the proximal portion is less sharp and less rounded than in the distal. The medulla, absent on the inner side, increases slowly toward the outer. When the medulla increases, the lower bundles are least atrophic. The discoloration then extends to the margin of the constriction, and with slight enlargement we can see some of the bundles passing beneath the floor of the constriction and artery.

Left Nerve: Papilla excavated. An axial section behind the globe shows the atrophy in front of the vessels, between them and the pial sheath where the greatest degeneration lies.

About 5 *mm* behind the globe, the atrophy is less than in the other nerve, and resembles a bow with its concavity outward and embracing the vessel. The nerve now shows a horse-shoe shape.

The degeneration in the apex of the orbit is elliptical in shape, and near the outer and lower periphery. In the middle of the canal it is sickle-shaped, with concavity up, and near the horizontal diameter of the nerve.

The intracranial end of the canal once again reveals pressure atrophy. The previous elliptical section now gives way to an oval with one edge round, the other flat.

Nearer the constriction, the section becomes triangular, the ill-defined atrophy lying close to the inner angle. Toward the orbit, the nerve bundles are once more medullated.

On following the sections through the stump of the constriction, we find the edges round internally, blunt externally, and thicker at the inner edge. The margin of the constriction has non-medullated fibres. Near the constriction the atrophy is marked internally, and decreases outward.

Frontal sections through the chiasma show narrow bands with lateral tumefactions, the centre non-medullated, the right tumefaction with discolored medulla.

Microscopic examination proves that the finer alterations are most noticeable at the constriction. Longitudinal sections show the lower plate of the pial sheath running uninterruptedly along the floor of the constriction. The upper plate at the margin of the constriction sinks over to the floor, then curves up, and then rising still farther, passes across to the other side. The continuity of the connective-tissue sheath is well preserved, but is at places very thin.

The curvature at the distal stump of the constriction is slight in the central bundles, and increases noticeably from above downward.

The so-called "cicatrix" now consists of irregularly twisted bundles of fine fibres without medullary tinting, and much resembling connective tissue. The septa with their vessels are sharply defined. Between them are cells like those seen in connective tissue. Occasional endothelial cells, and granular cells resembling medulla, and fine dust are scattered about.

Similar fibres are seen near the nerve-fibre bundles, regular in shape, but wavy in outline, with interlying nerve tissue of very delicate fibres, and the products of fibrous degeneration. Away from the constriction, the nerve fibres are more numerous, but varicose and swollen.

The medullary remnants take the form of fine dust or black spots or globules, according to the specimen. Some are dark, others gray. They are not stratified, and the absence of amyloid bodies is worth mentioning.

The central and upper terminations of the bundles in the proximal stump are longest and more curved downward, the lower bundles showing well-preserved fibres.

The distal segment of the constriction is marked by curvature and intertwining of the non-medullated bundles, and the same histological alterations as on the right side.

The right papilla and nerve close to the globe show more atrophy behind the lamina than farther along. There is no medulla at the papilla, only scanty granules, black globules, and a few fine, dark-contoured fibres. Behind the lamina the medullary contents and nerve fibres increase. The inner half of the nerve, apparently normal to the eye, shows important alterations, such as loss of medulla and fibrous degeneration.

The axis-cylinders in the lamina are attenuated, and there is no trace of a former papillitis, though the retina exhibits well marked changes in the ganglionic layer.

The increase of medulla behind the globe is more pronounced the farther we go toward the orbit. Whilst the bundles most affected 2 *mm* behind the globe and near the sheath have no medulla, there are none such where the central vessels enter, as comparison between Figs. 3 and 4 show. The atrophic bundles vary in size according to the degeneration, and they vary in color according to the preparation.

The *left* retina exhibits thinning of the nerve-fibre layer, and atrophy of the ganglionic cells, but no papillitis. The finer histological alterations are substantially as on the other side.

The *tumor* was examined partly in connection with the constricted portion of the nerves, and partly in longitudinal sections after removal of the sella. After removal of the tumor it left in the sella a cavity as large as a walnut, the two diameters of the sella on a plaster cast measuring 21 *mm* and the depth 22 *mm*. The enlargement of the cavity in the sella is accompanied with thinning of its walls. The tumor grows softer toward the central cavity. It is enveloped in the dura mater, and by a sheet of the same is separated from the optic nerves.

The firmer portion of the tumor is composed of irregular round or polyhedral epithelioid cells, with voluminous nucleus, as well as of cellular strands, containing larger or smaller vessels with a little connective tissue. The strands are dichotomously or dendritically divided, whilst the intervening tissues are filled with similar irregular cells. The strands seem to have been developed from the spindle-shaped clumps of tumor elements, which are visible in the fissures of the connective tissue, as well as in the envelope of the tumor itself. Some of the groups of cells have suffered colloid degeneration. The connective-tissue foundation of the cellular strands in the denser portion exhibits hyaline metamorphosis, which easily accounts for the softening of the interior of the tumor. The firmer portions of the growth are rich in ves-

sels, from which the hemorrhages in the middle of the tumor have originated.

For these reasons I am inclined to call the tumor a plexiform sarcoma, bearing some resemblance to a cylindroma.

The symmetry of the furrows, in one of which the artery was found, proves that both nerves were constricted by the pressure of the arteries of the corpus callosum. The mechanism of this was shown by Tuerk, who demonstrated that a tumor arising from the sella must constantly push the roots of the nerves with transverse pressure against the arteries. Leber suggested that the constriction was facilitated by the arterial tension due to the upward pressure of the base of the brain. Another cause is the lateral separation of the optic nerves, which extended to the bifurcation of the artery of the corpus callosum from the internal carotid. When this occurs, each branch of the nerve lies between the branches of scissors, the blunter branch the carotid, preventing farther deviation, whilst the sharper branch, the tense artery of the corpus callosum, presses into the nerve already softened by the pressure of the tumor.

But this is not all. The carotid produces pressure atrophy on the outer side of the nerves in the same way as the anterior cerebellar artery on the upper surface. It cuts into the nerve and widens the outer end of the furrow, which embraces the main artery, just as the smaller furrow on the upper surface embraces its branch. If we did not find the lateral separation of the nerves in this case, we should lose one of the most important causes of the constriction, and it is this which may explain the absence of the constriction in so many tumors of the hypophysis of the brain.[1]

I will here insist that the nerves can only be constricted by the vessels of the base of the brain when neither are surrounded by the tumor.

The constriction on the left side was total; on the right a few bundles retained their capacity for conduction.

In addition to the rare constriction of the optic nerves, this case exhibited compression and flattening of the chiasma.

[1] Abercrombie is the only author who notes this separation in similar tumors. *Path. u. Practisch. Untersuche ü. d. Krankheiten d. Gehirn u. Rueckenmk.*, Bremen, 1829, p. 436.

Another unmentioned mechanical injury to the nerves by similar tumors may be the curvature of the nerve at the foramen opticum, and the pressure atrophy of the dorsal bundles thus excited. This may occur more often than has so far been seen, and may also prevent the entrance of fluid into the intravaginal sheath and be a remote cause of papillitis.

The medullary destruction is more rapid where pressure has been at work, than in the portions secondarily affected. This is generally preceded by varicosities in the nerve fibres. The medulla loosens itself from the nodular mass and clings to the fibres like globules or granules, the latter resembling delicate medulla. The free medullary globules coalesce into round structures, which in turn are gradually transformed into a dust which is partially pushed aside by various cells. When the pressure atrophy ceases, the granular cells disappear. The fibres secondarily degenerated have the same but fewer medullary globules, and are identical with the globular deposits seen by Schmidt-Rimpler in secondary degeneration of the nerves after lesions of the spheres, and with Wagenmann's myeline degenerative products of the nerve substance.

Concerning the finer relations of the axis-cylinders, I would say that it seems to me as if the attenuated fibres pass into the wavy fibrillæ which take the place of the nerve tissue, and are consequently to be regarded as degenerated offshoots of the cylinders themselves. Certainty is doubtful, owing to the difficulty of isolating such fragile sections. One thing is sure: the wavy fibres facilitate the distinction between the earlier stages of pressure atrophy and the secondary degeneration. This is seen in the contrast between the coarser dotting of the pressure atrophy and the homogeneous appearance of the secondarily degenerated bundles. The number of ganglion cells is also less in pressure atrophy than in simple atrophy.

The bundles degenerated secondarily contain additional grayish fibres which resemble those seen by Uhthoff[1] in multiple sclerosis of the optic nerves. This point is well brought out by carmine and eosine tints.

[1] *Archiv f. Psych. u. Nervenkrankheiten*, Band xxi., p. 46.

As we follow the secondary degeneration, we are struck with its limitation to two almost symmetrical bundles on each side, and all the more so, since, so far as their form and change of locality in various sections of the nerves are concerned, they behave precisely like the papillo-macular bundle of which so much has been written. And this justifies the assertion that the secondary degeneration on its way to the eyeball has followed the papillo-macular bundle of nerves.

Like this bundle, so does our degenerative deposit describe a spiral in order to pass from the bony canal to the chiasma.[1] Just as in the isolated toxic diseases of this bundle, the fibres next to the axis and vessels are generally least affected, so the degenerated portions of the nerves in this patient exhibit gradually increasing atrophy from the sheath to the vessels. So, too, the variations between the wedge- and the semi-lunar-shape are approximatively seen in the various sections. At the same time, the definition between the degeneration in the orbit and the canal is well marked, and only ill-defined in the intracranial portion, where we see both secondary degeneration and pressure atrophy due to the tumor.

The morbific disposition exhibited by the papillo-macular bundle (toxic and idiopathic neuritis, multiple sclerosis,[2] and neuritis glaucomatosa[3]) sufficiently explains why the pressure on the upper surface first replies with secondary degeneration, and why the conduction along its fibres is first interrupted.

The secondary degeneration may not be due to arterial compression, but to compression at the chiasma, which, in our case, must have been great and long continued. In point of fact, the most distinct pressure atrophy was seen in the middle of the chiasma, the seat of the crossed fascicles and the papillo-macular bundle.

Finally, we note with great surprise the limitation of the secondary degeneration to certain groups of bundles, as well as its increase toward the globe, or at least from the entrance

[1] Bunge, *Ueber Gesichtsfeld u. Nervenfaserverlauf*, etc., p. 18. emphasizes the fact that the papillo-macular bundle in the intracranial portion of the optic nerve presses inward and upward.

[2] Uhthoff found, in 24 cases, 15 with central scotoma, 7 being unilateral and 8 bilateral. Only one case resembled the scotoma seen in the toxic ambylopiæ.

[3] Schnabel, *Archiv f. Augenhlkde.*, Band xxi., p. 284.

of the central retinal vessels up to the globe, because this is contrary to our accepted ideas of the "descent" of atrophy from the spot where the interruption of conduction has taken place.

Explanation of the Figures.

FIG. 1.—Representation of the tumor, natural size.

H. T., tumor of the hypophysis; E., rupture in its upper wall; N, o. d., right optic nerve; N, o. s., left optic nerve; Ch., chiasma; A. c. a. d. and A. c. a. s., right and left anterior cerebral arteries; A. c. i. d., and A. c. i. s., right and left internal carotid arteries.

FIG. 2.—Weigert preparation; obj. 8; eyepiece 2.

Medullated fibre-bundle in a condition of total pressure atrophy, from the distal segment of the right constriction; f. M. f., finest medullary fibres; M. k., free medullary globules; i. F., wavy fibres.

FIG. 3.—Weigert preparation; Zeiss, object. A; eyepiece 1.

Cross-section of the right optic nerve 2 *mm* behind the globe.

FIG. 4.—Weigert preparation; Zeiss, object. A; eyepiece 1.

Cross-section of the right optic nerve directly in front of the entrance of the central retinal vessels.

V. c., central vessels.

EXOPHTHALMUS DUE TO ORBITAL HEMORRHAGE.

By Dr. HARRY FRIEDENWALD and Dr. ALBERT C. CRAWFORD, of Baltimore.

THE subject of exophthalmus has been discussed extensively in recent medical literature. The pathological conditions which may produce this deformity are varied. In most cases it results from some encroachment upon the intraorbital space; in a few, the anterior dislocation of the eyeball is due to relaxation from paralysis or injury of the ocular muscles. Among the factors producing encroachment upon the orbital space may be mentioned: enlargement of the intraorbital vascular system, neoplasms, inflammatory products, lymphoid growths,[1] disease of the orbital walls and neighboring cavities, and intraorbital hemorrhage. It is this last-mentioned factor to which we wish to direct attention.

Intraorbital hemorrhage may be traumatic or spontaneous; by spontaneous we mean, not due to an injury from without. Cases under both heads are comparatively rare. Berlin met with but six of the traumatic variety among 35,376 cases of diseases of the eye, and he was able to collect but three indisputable examples of the spontaneous variety in medical literature up to the year 1880.[2] A fourth case[3] he excludes for the reason that the diagnosis was not sufficiently certain.

Von Graefe explains the rarity of spontaneous intraorbital

[1] In leucæmia see Leber, *Graefe's Archiv f. Ophthal.*, vol. xxiv., part 1, p. 295; and also Loring *Textbook of Ophthalm.*

[2] Graefe and Saemisch, *Handbuch der Augenheilk.*, vol. vi., p. 560.

[3] Von Graefe, *Arch. f. Ophthalm.*, vol. i., part 1, p. 424. We shall refer to this below.

hemorrhage by the fact that the orbital vessels are under the uniform pressure of the eyeball, which thus mechanically supports them.[1]

To Berlin's list of traumatic cases may be added one of Snell,[2] one of Ullrich,[3] one of Galezowski,[4] one of Pagenstecher,[5] one of Priestley Smith,[6] and four cited by Schliephake,[7] besides one which we shall presently describe. It must be noted, however, that this list is by no means complete.

This variety of orbital hemorrhage may be due, as Berlin[8] shows, to a perforating injury or to external violence in which case there is usually a fracture of the bony walls of the orbit. Whether due to direct or indirect trauma there are usually palpebral and conjunctival ecchymoses, together with chemosis. But there is this difference,—that when the trauma is direct the ecchymoses appear immediately; while when it is indirect and fracture of the orbital walls occurs, the conjunctiva and lids may at first show no sign of hemorrhage, but usually the blood appears later and gradually advances toward the cornea; in some cases the lid alone is discolored.

The late appearing sub-conjunctival hemorrhages were formerly considered a classical sign of orbital fracture, especially of the roof, but Berlin has shown that this cannot be absolutely relied upon.[9] Albert states that they may arise from blood primarily effused into the cranial cavity which subsequently finds its way into the orbit through the optic or anterior lacerate foramen.

The appearance and the degree of exophthalmus, it is

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[1] Von Graefe, *Arch. f. Ophthalm.*, vol. i., part 1, p. 430.
[2] *Ophthalmic Rev.*, vol. i., 1812, p. 402.
[3] Zehender's *Monatsbl. fuer Augenheilk.*, 1882, p. 242.
[4] Quoted by Ullrich, *Monatsbl. fuer Augenheilk.*, 1882, p. 246.
[5] Knapp, *Archiv. of Ophth.*, 1884, p. 22.
[6] *Royal London Ophthalm. Hospital Reports*, July, 1888. Summarized in Hirschberg's *Centralblatt fuer Augenheilkunde*, 1889, p. 59. This case deserves special mention. It occurred in a *hemophilic* youth, seventeen years of age, resulting from a blow on the middle of the eyebrow. This is the only case which we have been able to find, in which hæmophilia played any part in the production of exophthalmus.
[7] Ueber Verletzungen des N. Opt., etc. *Inaug. Diss.*, Giessen, 1888.
[8] Graefe and Saemisch, vol. vi., p. 560.
[9] *Diagnostik der chirurg. Krank.*, 4 ed., 1887, p. 51.

almost needless to explain, depend upon the amount and situation of the blood extravasated. If there is a fracture of the orbit communicating with the nasal cavity, the blood may thus escape without producing any protrusion. Again if the amount of effused blood is small, no exophthalmus may occur. Besides the exophthalmus there is usually more or less restriction of the movements of the eyeball, and frequently the vision is greatly diminished or even entirely abolished. The visual impairment may be due to retinal concussion,[1] to the pressure exerted upon the nerve by the extravasated blood,[2] to stretching [3] or tearing of the nerve,[4] or even to a subsequent descending neuro-retinitis, the result of meningeal inflammation.[5] The exophthalmus itself does not greatly impair vision, for we frequently see marked cases due to the gradual growth of tumors, in which, excepting the diplopia, there is little visual disturbance.

As an exceedingly rare cause of traumatic hemorrhagic exophthalmus, we may mention delivery of the child—especially instrumental delivery. Thus Philipsen [6] observed a child delivered with difficulty but without instrumental aid, in which exophthalmus appeared on the second day. Within three months, the tumor, which could be felt behind the eyeball, disappeared, as did also the exophthalmus. Philipsen regarded it as a cephalhæmatoma. In a second case of Redemans [7] forceps were used. Two hours after labor, the right eye protruded, the exophthalmus became so great that the lids were closed behind the eyeball, and reposition was possible only after the eyeball had suppurated and shrunken. A third case coming under this head is that of Lomer.[8] There are other published cases of exophthalmus following labor, but they appear to be dislocation of the eyeball by direct violence, and are not pertinent to our subject.[9]

[1] Gowers' *Medical Ophthalmoscopy*, 5 ed., p. 183.
[2] Pagenstecher, Knapp's *Archives of Ophthal.*, v. xiii., 1884, p. 22.
[3] Gowers, p. 183.
[4] Capron, Knapp's *Archiv. of Ophthalm.*, vol. xi., p. 335.
[5] Manz, *Graefe's Archiv f. Ophthalm.*, vol. xii., part 1, p. 1.
[6] *Ann. d'Oculist.*, December, 1891.
[7] *Ann. d'Oculist.*, xxvii., p. 89.
[8] *Berlin gynaek. Gesellsch.*, Dec., 1883.
[9] See Bloch, *Centralbl. f. Augenheilk.*, 1891, p. 134.

We can best describe the clinical history of traumatic orbital hemorrhage by relating the following case, which came under our observation within a few hours after the injury.

CASE I.—T. B., age sixty, white, stone-cutter, July 3, 1890, while chiselling stone, was struck in the left eye by one of the fragments. The vision of this eye was at once lost. There was some bleeding from the lid. At the examination of the eye a few hours later, a small wound was found in the upper lid near the inner canthus; there was slight exophthalmus, which was evidently due to a tense swelling back of and around the eyeball. The tumor could be distinctly felt by the finger, especially above the eye. The lids were swollen to such a degree that the eye was uncovered with difficulty; the conjunctiva was somewhat œdematous, and the pupil dilated. Movements of the eyeball were restricted. The ophthalmoscope revealed an intensely white papilla, the retinal arteries so attenuated that they could scarcely be seen, and the retinal veins filled to their normal size. Vision = 0.

July 4, 1890.—Eye no longer prominent; papilla normal in color. V unchanged.

July 5.—Eyelids have become greatly discolored from palpebral extravasations. The exophthalmus has disappeared and likewise the tense tumor felt behind the eyeball.

July 6.—The movements of the eyeball are normal. The left pupil reacts only when strong light is thrown into the right eye.

July 7.—The opthalmoscopic picture is unchanged. Slight pressure causes pulsation of both the arteries and veins, showing that the blood pressure is diminished. Amaurosis persists.

July 10.—The color of the left papilla is fairly good; the nasal portion is of a healthy pink color, but the temporal part is pale. There are very slight variations in the calibre of the arteries, which are narrower than they should be. Small pale spots are seen scattered near the nasal side of the papilla, especially along the course of the vessels (colloid). The right eye is normal, excepting a few spots similar to those in the left eye. When seen again in August, 1893, the retinal vessels of the left eye were very narrow, and the papilla atrophic. The spots mentioned above were not noted. V. = 0.

It is not difficult to decide upon the manner in which the blindness occurred in this case. The foreign body was very

small, and struck the upper part of the orbit, passing through the upper lid. It is scarcely conceivable that it could have passed back and directly injured the nerve, and still less, to have fractured the orbital walls around the optic foramen. We are therefore forced to the conclusion that the blindness resulted from the pressure of the extravasated blood upon the optic nerve and the retinal vessels. In this case it must be noted that the amount of hemorrhagic effusion was not very great, for it caused but slight protrusion, and rapidly subsided. The pressure upon the ophthalmic artery produced great attenuation of the retinal arteries and pallor of the papilla, while the subsequent atrophy of the papilla was probably secondary and ascending.

This view receives additional support from the fact that the effusion could be felt as a very tense and resisting tumor which must have exerted great pressure upon its surroundings.

The published cases of traumatic hemorrhagic exophthalmus differ from the case just described in the degree of the exophthalmus, the impairment of mobility and the visual disturbance, but they are essentially similar.

Let us now turn our attention to the spontaneous variety. We have already mentioned the cases cited by Berlin.[1] To these may be added two of Ayres,[2] two of Sattler,[3] one of Magnus (scurvy),[4] three of Spicer (infants with scurvy rickets),[5] one of Panas,[6] one of Jeafferson (whooping-cough),[7] one of Mitvalsky [8] (the two mentioned last were blood cysts), one of Day,[9] and one which we shall now describe [10]:

S. B., aged 43, a stout, heavily-built negro. Came to City Hospital Dispensary, May 16, 1892, complaining of gradual failure

[1] *Loc. cit.*
[2] Knapp's *Archives*, vol. x., 1881, p. 42.
[3] Knapp's *Archives*, vol. xiv., 1885, p. 190.
[4] *Deutsch Med. Wochenschr.*, vol. iv., 1878, p. 29, summarized in Schmidt's *Jahrbuecher*, vol. clxxxii., 1879, p. 58.
[5] Knapp's *Archives*, vol. xxii., 1893, p. 390.
[6] *Arch. d'Ophtal*, vol. viii., 2, p. 153, reviewed in Knapp's *Arch.*, vol. xvii., 1888, p. 511.
[7] *Lancet*, 1889, vol. ii., p. 111.
[8] Hirschberg's *Centralbl.*, 1893, p. 1.
[9] *Medical News*, vol. lii., 1888, p. 460 (incomplete history).
[10] Since sending this paper to the publishers we have found another case due to scurvy-rickets; see Railton, *Lancet*, March 3, 1894.

of sight. His previous history was fair. He stated that he had no recollection of having had ordinary diseases of children, or rheumatism, but had had two attacks of smallpox. Admitted having had gonorrhœa a number of years ago. A stricture gradually developed, and with it cystitis. Denied syphilis. Had been much addicted to alcohol and tobacco. He traced his failure of sight to an attack of grippe six months previous. The ophthalmoscopic examination showed that the macular half of the left papilla was pale, the right papilla decidedly atrophic. V, R. E., $\frac{4}{60}$, V, L. E., $\frac{4}{5}$ almost. There was a central scotoma for red in the left eye. In the right eye this color could not be recognized anywhere throughout the field. There was absence of patellar reflex, but there were no signs suggesting tabes dorsalis. The visual trouble was evidently due to a retrobulbar neuritis, and was perhaps the result of the grippe, or more probably owing to the excessive use of tobacco and alcohol, to which he was addicted. Strych. sulph. was ordered, and strict abstinence from alcohol and tobacco was insisted upon. He came from time to time for several months, continuing the use of strych., but there was no improvement. It may be mentioned that we had good reason to believe that he did not abstain from either tobacco or alcohol.

Jan. 18, 1893.—He presented himself with very marked exophthalmus of the right eye. He assured us that he had not suffered any injury, and that when he went to bed on the previous night, his eye was in its normal position. After having risen in the morning and washed, he experienced a "shooting" pain in the eye, and felt that the eye protruded. We saw him a few hours afterwards, and found the eye almost out of the orbital socket and somewhat painful. The exophthalmus measured about half an inch, and was almost directly in the visual line. The eyeball could not in the least be forced back into the orbit, the pressure exerted causing pain. The palpebral fissure was very much widened, and the eyelids could not be closed entirely. When they were still further separated, the eyeball seemed to be almost entirely out of the orbit. V, R. E.: Could not count fingers correctly even when held near the eye. Ophth. examination: Papilla very white, arteries and veins narrowed, the picture being the same as above, so far as can be seen. The conjunctiva showed no inflammatory signs. The movements of the eyeball were restricted in all directions. A pressure bandage was applied, and mercurial inunctions and potassium iodide were

ordered. On the following day the pain had entirely subsided, but the exophthalmus remained unchanged. Vision had improved slightly: he could count fingers when held very near. The lower portion of the ocular conjunctiva which was exposed in the palpebral fissure, being unprotected, became reddened and swollen. The rest of the conjunctiva was perfectly normal.

Jan. 20. — The exophthalmus had subsided considerably. Vision the same. The field of vision was almost abolished on the nasal side, and greatly restricted below. He could at this time almost close the eyelids. There was scarcely any sensitiveness to pressure. There was gradual improvement until

Feb. 2, when the exopthalmus had greatly diminished. (There were but 3–5 *mm* of protrusion.) The conjunctival congestion, which was always limited to that part of the ocular conjunctiva which was exposed, had almost disappeared. There was neither pain nor sensitiveness. The caruncle appeared prominent, and pressure on the eyeball caused it to protrude still farther. When the left eye looked directly forward the palpebral fissure of the right was almost twice as large as that of the left, but the right cornea was not exposed, on account of a high degree of strabismus sursum vergens which had gradually manifested itself. The eye was also somewhat divergent.

Feb. 6.—We could not find any exophthalmus (nineteen days from its first appearance), but there was still strab. diverg. superior. The strabismus gradually disappeared, vision improved a little, and May 9th it was found to be about the same as when examined a year previous. The ophthalmoscopic picture was unchanged, papilla white, and vessels narrow.

At no time during the history of this case was there any blood to be seen under the conjunctiva, though it was looked for from day to day. The eye was frequently examined to detect a bruit, but none could be discovered, nor could any pulsation be felt. The urine contained albumen, but no sugar.

Feb. 27.—We re-examined the patient, and found V, L. E., $\frac{1}{20}$, V, R. E. reduced to seeing movements of the hand at two feet. The field of the left eye had normal limits, but there was a central scotoma (absolute for red) about 14° in breadth and about 10° in height, not reaching to the blind spot. The field of the right eye could not be accurately taken. The limits appeared to be normal, but there was a very large and absolute central scotoma. The appearance of the retina and nerve of both eyes was

unaltered. It was noted that the arteries showed decided variations in their calibre, with slightly hazy borders at certain points —indications of arteriosclerosis.

The general condition remained unchanged. The arteries at the wrist were palpable after blood was forced out, but the temporal arteries were not. There was a blowing systolic murmur heard at the apex, but neither sound was accentuated. The apex beat was 1 *cm* outside the nipple line in the fifth interspace. The urine was markedly alkaline, with ammoniacal odor, and there was some albumen, but no casts. It contained red and white blood corpuscles (cystitis). Spec. gravity, 1022.

The diagnosis in this case was spontaneous hemorrhage into the orbit. The grounds for this were: First, the *suddenness* of the onset; second, the comparative freedom from pain; third, the absence of any inflammatory signs, of throbbing or of bruit.

It will be seen that the vision of both eyes was greatly diminished. We could not account for this, except as a result of his intemperance. The previous optic nerve trouble complicates the case. The vision of the R. E. was very poor before the exophthalmus developed, but it was evidently diminished to some extent by this occurrence, and remained permanently impaired.

The cause of the hemorrhage into the orbit in this patient seemed to be due to a degenerated condition of the vascular walls, as shown by the thickening of the radial arteries, the position of the cardiac apex, and especially by his personal habits, as mentioned above. The appearance of the retinal arteries furthermore supports this view.

This case presents great similarity to that of v. Graefe.[1] The high degree of amblyopia of the right eye prevented any diplopia, but the muscular paralyses were very similar, even to the strabismus sursum vergens which came on before there was complete recovery. The course was about the same (fourteen days in v. Graefe's case). In that case likewise no blood appeared under the conjunctiva during the entire course. It was for this reason that Berlin excludes

[1] Referred to at the beginning of this paper.

this case, as mentioned above. Nevertheless, we consider that in both cases the diagnosis of orbital hemorrhage is sustained.

A careful review of the three cases cited by Berlin, together with v. Graefe's case and the twelve cases which we have collected (leaving out that of Day because of insufficient data), will show that spontaneous hemorrhagic exophthalmus may occur at any period of life, from infancy to old age. It is usually monocular, but may be binocular (Sattler, two cases), and may be recurrent (Fischer, one, Sattler, one, and Magnus one). It may depend upon a hemorrhagic diathesis (as in three cases cited by Berlin, in Magnus's case of scurvy,[1] and in the three cases of Spicer, or upon arterio-sclerosis (Sattler, two cases, and our own). The onset of the exophthalmus is very sudden (except in the case of Fischer, in which it depended upon frequent but small hemorrhagic effusions, gradually producing exophthalmus). The movements are restricted in most cases. The duration of the exophthalmus, which usually disappears completely, is a few weeks (two to four), but the effusion may persist for a long time. The occurrence of conjunctival ecchymoses, upon which Berlin lays the greatest stress, considering it the critical sign of orbital hemorrhage, varies very much. It is noted in the three cases cited by Berlin, in one of Ayres's, and in one of Sattler's cases, but not in v. Graefe's, in Ayres's second case, in Sattler's first case, in Magnus's (there was suggillation of the upper lids), and in ours. We do not, therefore, consider this sign as absolutely necessary for the diagnosis. The aspirating needle, which was used in several cases (Ullrich, Jeafferson), establishes the certainty of the diagnosis when a quantity of blood is emptied, and the eye then goes back to its proper position.

The rapidity of the onset is not absolutely peculiar to hemorrhages, for an orbital abscess may also make its appearance within a short time. But the latter may be distinguished by the inflammatory symptoms (fever, con-

[1] Berlin refers to the fact that some writers mention the occurrence of orbital hemorrhages in typhus and scurvy, but he was unable to find a single authentic case.

gestion, œdema of the conjunctiva and lids, etc.) which usually accompany it,[1] and the termination in discharge of the pus. Inflammatory symptoms likewise characterize thrombosis of ophthalmic veins. In the case which we have just described, there was never any fever or throbbing pain (the pain was never severe, seemed to be due to the tension of the tumor behind the eye, and soon disappeared).

The rapid onset enables us to distinguish this condition from various tumors which occur in the orbit. The rapid subsidence is characteristic of most cases. In some the course is protracted, and in a few the blood becomes encapsulated, forming a hematocele (Jeafferson, Mitvalsky, and Ullrich; this last was a traumatic case).

According to Wecker,[2] the seat of intraorbital hemorrhage may be between periosteum and bone, in the fatty tissue of the orbit, or between the eyeball and Tenon's capsule.

In both of our cases there were distinct ophthalmoscopic changes, consisting of pallor of the papilla with narrowing of the vessels. Pagenstecher, in the examination of a similar case, observed white spots which followed the course of the vessels and disappeared on restoration of the circulation, but in none of the other cases of which we have any record were they noted.

The appearance of retinal detachment may be produced, as in the case reported by Ullrich,[3] in which the diagnosis of simple detachment was made; so confidently was this diagnosis held that the patient was shown as an example of retinal detachment; the error became apparent on later examination, when an incision was made and the effused blood evacuated, with the disappearance of the pseudo-detachment. In this case the retinal vessels were enlarged and tortuous, the retina cloudy, the limits of the papilla indistinct, and there was projection of the lower portion of the retina into the vitreous.

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[1] But not always. V. Graefe recommends an early puncture to ensure the correct diagnosis.

[2] Graefe and Saemisch, *Handbuch.*, vol. vi., p. 558.

[3] Von Graefe and Berlin have also described the appearance of retinal detachment in orbital abscess, which disappeared on emptying the pus (*vide* Ullrich, *loc. cit.*).

While there were distinct ophthalmoscopic changes in both of our cases, this does not always occur, for in three of Berlin's cases, in one of Ayres's, and in Jeafferson's case there were no ophthalmoscopic changes.

The same condition of the vessels which is favorable for post-bulbar hemorrhage would seem to predispose to intra-ocular hemorrhage. Thus, in the case of Sattler, the orbital hemorrhage was complicated by hemorrhagic retinitis. In some of these cases one would anticipate cerebral hemorrhage,[1] but we have no note of such an accident in any of our series.

The tolerance with which some eyes bear hemorrhagic effusions is remarkable; in Jeafferson's case, vision was unaffected, though the exophthalmus had lasted five months.

Besides the direct effects of the injury which occur in traumatic cases, vision may be further affected; the effusion, by pressing on the optic nerve, may mechanically interfere with its circulation, while pressure on the nerves (3–4–6) supplying ocular muscles may cause restriction of motion with its sequence, diplopia, and mydriasis may occur. Vertical pressure on the eyeball itself may cause elongation, with consequent myopia; this was well seen in Ullrich's case, where a myopia of 6 D at the macula disappeared on evacuating the effusion. The opposite condition, hypermetropia, may also be produced in a similar manner.[2]

We need add little concerning the treatment. In our cases, the application of cold and a compress bandage was mainly relied upon. Some authors advise the use of the trocar (v. Graefe, Jeafferson), others make a free incision, and these procedures are undoubtedly necessary in those cases in which the blood becomes encysted. Panas, however, considers it inadvisable to operate, because of the liability to recurrence.

[1] Gowers's *Med. Ophthalmoscopy*, third edition, p. 40.
[2] Pagenstecher, Knapp's *Archives*, vol. xiii., 1884, p. 22.

REPORT OF 549 CATARACTS OPERATED AT PROF. SCHOELER'S EYE CLINIC, IN BERLIN.

By Dr. WALTER ALBRAND, of Berlin.

Translated by Dr. R. O. Born, New York.

THE section, with a Graefe knife, starting as a flap, was finished as an almost linear section. The operation was made either with or without iridectomy, the capsule was generally divided with Graefe's cystitome in the shape of a T; the capsule forceps was only used for the removal of thickened portions of capsule; in some cases remnants of cortex were removed with the forceps; generally remnants were removed by rubbing.

The bandage was changed for the first time on the fourth day, and after the second change of dressing, on the sixth day, atropine was instilled (up to six times daily), for a week or ten days. By the more frequent instillations of atropine we can, particularly in younger individuals, tear posterior synechiæ and obtain a full dilatation of the pupil. Atropine and other mydriatics are only contra-indicated when the operation is complicated by secondary glaucoma, photophobia, and lachrymation. In filamentous keratitis, after cataract operations or other corneal wounds, atropine should not be used. The filaments, may they be a parenchymatous corneal exudation, or proliferation of the corneal epithelium,[1] or according to Czermak[2] adherent conjunctival

[1] Beiträge zur Kenntniss der Fädchenkeratitis, von Dr. C. Hess. *v. Graefe's Archiv*, Bd. xxxviii., und Ophth. Congress zu Heidelberg, 1892.

[2] *v. Zehender's klin. Monatsbl. f. Augenheilk.*, 1891, u. *Wiener klin. Wochenschr.*, 1891, No. 20.

exudation, are under certain conditions increased by the use of atropine.

The number of senile cataracts operated between 1884 and 1891 was 549, among 851 operations on the lens.

	OPERATIONS ON THE LENS.	TOTAL NUMBER
1	Extraction of senile cata. with iridectomy	232 } 549
2	" " " without "	317 }
3	" traumatic catar.	55
4	" complic. "	45
5	" soft "	16
6	Discission of soft "	29
7	" zonular "	12
8	" traumatic "	12
9	" congenital "	8
10	" progressive " (for maturing)	9
11	" secondary " (after class No. 1)	18
12	" " " (" " " 2)	45
13	" " " when extraction had been performed by other surgeons, or in complicated cases, or when performed in our institution, more than a year after extraction	53
	Total number of operations on the lens	851

Of these operations we shall only consider the extractions of senile cataract.

232 EXTRACTIONS WITH IRIDECTOMY.

Until March, '87, iridectomy immediately preceded extraction. From March, '87, iridectomy was omitted in 16 cases, but since in 7 of these cases a discission was required within three or four weeks, and since prolapse of iris occurred twice, a small iridectomy was again made in the 5 following cases. Since then, June, '87, simple extraction has been regularly practised, and, during the operation, iridectomy was made in only 16 cases. In the group of extractions with iridectomy are 20 in which the excision of iris had been made as a preparatory step weeks or even months before the extraction; in 12 cases it had been done for the rapid development of the cataract. Since the massage of the lens proved rather uncertain in its results, the maturing

was effected by discission of the capsule some days before the simple extraction of the lens. This appears to be the most rational procedure in the slowly ripening perinuclear cataract.

The acuteness of vision of all cases with iridectomy, inclusive of the 18 cases, in which secondary discission was made, was measured about four or six weeks after the operations and was as follows:

S IN 226 CASES.

								Fingers counted at					
$\frac{15}{15}$	$\frac{15}{20}$	$\frac{15}{30}$	$\frac{15}{40}$	$\frac{15}{50}$	$\frac{15}{70}$	$\frac{15}{100}$	$\frac{15}{200}$	15′	12′	10′	6′	5′	S = 0
2.	35.	43.	55	36	22	12	12	1.	3.	1	1	3	6

Three cases were lost by suppuration: (1) after massage and iridectomy three weeks previously, long rubbing at the extraction, on 4th day suppuration of wound, resulting in phthisis; (2) suppuration of wound on 2d day, abscess of vitreous, phthisis; (3) operation during last stage of facial erysipelas, peripheric section, long rubbing, collapsed cornea, suppuration starting from wound on second day, confined to anterior part of globe, faint perception of light.

Two eyes were lost by hemorrhage during the operation: (1) Soft cataract with high myopia and fluid vitreous; eye collapsed from loss of vitreous. After a few seconds with great pain, the eye was filled again by intraocular hemorrhage. (2) After extraction of cataracta nigra, the entire vitreous was pushed out by hemorrhage. Both cases resulted in phthisis.

Prolapse of vitreous occurred 15 times. In 3 cases the vitreous was fluid, 2 of them were lost; of the 12 with normal vitreous, 1 was lost by intraocular hemorrhage, another had closure of pupil with uncertain perception of light, in 2 other cases iritis with closure of pupil, later improved by iridectomy. In 2 of the 15 cases the eye was lost and in 6 others there was less than $\frac{15}{200}$.

Severe iritis was observed six times (this does not include smaller posterior synechiæ). Three of these were successful (in 2 $\frac{5}{200}$ after subsequent iridectomy and discission, in the third $\frac{1}{40}$ after discission). Of the 3 losses 2 have been mentioned before, in the third the operation had been normal, but the healing was complicated by slow iritis with partial closure of pupil. S = $\frac{1}{200}$. Six months later glaucoma and later progressive glaucomatous degeneration.

Glaucoma was noticed in 7 cases, of which only one proved successful, in a case with high myopia, with much remaining cortex, the resorption of which stopped in six weeks, after another week discission and gradual disappearance of increase of tension. In some of the other cases the glaucoma developed only 3 months, or even a year after the extraction.

In 8 cases good vision could not be obtained.

1. $\frac{5}{200}$ with high myopia, extensive choroidal atrophy, and positive central scotoma.

2. $\frac{5}{200}$ cataracta nigra, high myopia, no perception of light upward (probably detachm. ret.).

3. $\frac{12}{200}$, after discission, one year after extraction—high myopia, with extensive changes in fundus and positive central scotoma.

4. $\frac{15}{200}$, corneal leucoma.

5. $\frac{15}{200}$, divergence with uncertain perception before the operation.

6 and 7. $\frac{15}{200}$, high myopia, with uncertain projection before the operation.

8. Later diminution of S by retinal hemorrhages.

Of the 18 *discissions* 8 were made in the 25 eyes, which showed complications during or after the operations; in 4 cases of prolapse of vitreous (1) S = $\frac{1}{30}$, (2) S = $\frac{15}{200}$, in (1) S later lost by glaucoma; in (1) case after iritis S = $\frac{1}{40}$; in 3 cases discission was made during glaucomatous attack, in (1) S = $\frac{1}{60}$, two failures. Ten other discissions after regular extractions gave S more than $\frac{15}{200}$.

If we take $\frac{15}{200}$ or more as sufficiently good vision, we find 39 eyes (16.18 per cent.) with less vision. Of these 14 obtained better vision later by discission, and we have, therefore, 25 failures = 10.77 per cent, and final success 89.23 per cent.

317 EXTRACTIONS WITHOUT IRIDECTOMY.

Only the immediate visual results of all the cases are available, since most patients will not return after a few months, and only those cases will present themselves, in which former good sight declines at a later period. In 45 cases in which discission was made soon after the extraction, we have also the vision after discission. The percentage of visual results is given in the same manner, as in the former series.

S in 307 Cases.

$\frac{15}{15}$	$\frac{15}{20}$	$\frac{15}{30}$	$\frac{15}{40}$	$\frac{15}{50}$	$\frac{15}{70}$	$\frac{15}{100}$	$\frac{15}{200}$	Fingers at			S good, but could not be tested.	S = o
								15	12	10		
10	27	44	56	26	47	41	39	5	4	2	6	10

Six cases must be eliminated in which, after a regular operation and a normal course of healing, no test could be made. Case 1 and 2: A patient with diabetes, after a normal operation, had to be transferred to charity hospital, where she died. Case 3: A woman, seventy years old, died, on the fifth day, of apoplexy; operation regular, healing good. Case 4: A woman, eighty-two years old, operation and healing regular, delirium on fourth day, died on eighth day. Case 5 and 6: Sixty-five-year old man, very feeble; operation regular, healing good. On the twentieth day, with well-healed wound, he developed in the left eye a hemorrhagic purulent iridocyclitis with hypopyon and purulent exudation into the pupillary space. The process was probably a metastasis from an ulcerating carcinoma of the stomach. Patient was removed from the hospital by his relatives.

In 6 of the 10 cases with S = o, the eye was lost by *suppuration* (1.89 per cent. against 1.29 per cent. of the other series). Case 1: After normal healing, eye left open by mistake and wound infected on eighth day, resulting in panophthalmitis and phthisis. Case 2: After corneal section escape of fluid

vitreous; on second day purulent panophthalmitis, phthisis. Case 3: Double extraction; right eye, suppuration on second day, later exenteration; left eye healing normal. Case 4: Protracted rubbing at the operation, healing normal. On fifth day gaping of wound, purulent infiltration of cornea and aqueous, exudation into pupil. Final result, perception of light. Case 5: Cornea collapsed; suppuration on fourth day, finally iris attached to the grayish-discolored cornea. Case 6: Patient very restless after a regular operation, suppuration on second day, anterior phthisis.

Prolapse of vitreous occurred 9 times (2.84 per cent. against 6.5 per cent. of the other series), in 4 cases the vitreous fluid. Case 1: Suppuration. Case 2: Prolapse after corneal section, the luxated lens removed with the loop, S = $\frac{1}{50}$. Case 3: Small prolapse with the delivery of the lens, S = $\frac{1}{50}$. Case 4: Luxation of catar. nigra with cystitome; by rubbing moderate loss of vitreous; S = fingers at 10 feet.

In 5 cases vitreous healthy. Case 1: S = $\frac{1}{50}$, opacities of vitreous. Case 2: patient pressed, great loss of vitreous; S later, $\frac{1}{30}$; iris healed into the wound, but no prolapse. Two years later iridectomy, cystoid scar, angular incarceration of columns of iris, pupil drawn upward. Later, corneal ulcerations, and finally counted fingers at fifteen feet. Case 3: $\frac{1}{300}$, iris folded back, partly healed into the wound. Case 4 and 5: double extraction of hypermature cataract, with defective zonula. In left eye iris replaced, in right eye extensive prolapse, during delivery of lens; iris prolapse not replaced; cut off after twenty days. S, right eye, $\frac{1}{100}$; left, $\frac{1}{300}$. Two months later, slow iridocyclitis, with uncertain perception of light in both eyes (the right probably primary, the left sympathetic). Six of the 9 cases of prolapse of vitreous were failures.

Severe iritis was observed in 9 cases (2.84 % against 2.6 % in the combined extraction). Four of these were failures. Three have been mentioned before. Case 4: normal healing; on third day prolapse of iris, abscised on seventh day, columns of iris replaced. S = $\frac{1}{10}$. Later, occlusion of pupil, and after iridectomy, pupil again closed; fingers at

6′; projection good; improvement possible by further operation. Among the other cases was one of iridocyclitis, evidently of a quite accidental character; developed on twelfth day after a normal healing, with periostitis of the superior maxilla on the same side. S = $\frac{1}{10}^{5}$, with opacities of vitreous.

In Case 2, after excision of prolapsed iris on fourth day, severe iritis. S (without discission) = $\frac{1}{20}^{5}$.

Case 3: severe iritis; discission not required. S = $\frac{1}{40}^{5}$.

Case 4: three weeks after the extraction, suddenly suppurative iritis (rheumatic?); after further three weeks, discission; S = $\frac{1}{200}^{5}$.

Case 5: iritis with closure of pupil, with increase of tension. After iridectomy and discission, S = $\frac{1}{10}^{5}$.

Glaucoma was observed five times (1.6% against 3.3%, with iridectomy).

Case 1: S = $\frac{1}{30}^{5}$. Three years later, only perception of light from hemorrhagic glaucoma in spite of repeated operations.

Case 2: S = $\frac{1}{40}^{5}$. Two years later, sight gradually declined by chronic glaucoma.

Case 3: S = $\frac{1}{60}^{5}$. Sight reduced the following year by hemorrhage into the vitreous.

Only in 2 cases the glaucoma developed soon after the extraction.

Case 4: extraction with discission; ten days after the secondary operation an attack of glaucoma; iridectomy with prolapse of vitreous. S = $\frac{1}{30}^{5}$.

Case 5: three weeks after an extraction with normal healing, hemorrhage into the vitreous with slight increase of tension, which yielded to eserine and fomentations. S = $\frac{1}{300}^{5}$.

Prolapse of Iris, i.e., beyond the corneal wound, occurred 20 times (6.3%), and was abscised in 19 cases. In 1 case the prolapse was small, and was left undisturbed. S = $\frac{1}{60}^{5}$. In 14 cases, without further after-operations: in one case, S = $\frac{1}{20}^{5}$; in one, $\frac{1}{30}^{5}$; in four, $\frac{1}{40}^{5}$; in two, $\frac{1}{50}^{5}$; in two, $\frac{1}{70}^{5}$; in four, $\frac{1}{200}^{5}$. In 4 of the remaining 5 cases, discission was made: S = $\frac{1}{20}^{5}$ in one, $\frac{1}{40}^{5}$ in two, $\frac{1}{200}^{5}$ in one

case. The fifth case was complicated with iritis; repeated iridectomies, but S declined. The iris showed a tendency to prolapse at the time of the operation in 4 cases, the pupil was oval and drawn toward the section; in 2 of these cases atropine had been instilled before the operation; in 4 the patients had been very restless after the operation; 1 had severe vomiting. In most cases the iris could be replaced after abscission of the prolapse, and no further complications occurred in these, except in 1, where later an iridectomy was made.

It must certainly be admitted that peripheric adhesions of the iris to the inner lip of the wound, and also more central attachments, happen more frequently after simple extraction than incarceration of the columns of the iris in extraction with iridectomy. Large cystoid scars were not observed in the simple extraction, probably because the prolapse was abscised, after the use of eserine had proved ineffectual[1]; smaller, partial incarcerations of iris into the wound, in some cases even with cystoid protrusions, are noted in a dozen cases, and in half of these cases the position of the pupil had been unsatisfactory immediately after the extraction. Whenever, in simple extraction, the pupil is not entirely central, it is certainly advisable to perform an iridectomy at once. These cases show a great tendency to prolapse, and we cannot always expect to replace the columns of the iris. The eventual danger of angular incarceration is proven by the one case with loss of both eyes. The infection may, as Wagenmann[2] claims, start from the incarcerated prolapse, and the other eye may be lost by sympathetic inflammation.

Accidental complications, with S $\frac{15}{200}$, or less, were 15, for instance: hemorrhages, atrophy of od., central scotoma, solut. ret., chor. atrophy, sclerochoroid. post. As far as we could learn, there were 37 final failures (11.7 % against 10.8 % with iridectomy).

[1] Sometimes the iris can be replaced by the use of eserine. In one case, prolapse occurred on the fifth day, and the iris was drawn into the anterior chamber by the energetic use of eserine.

[2] *V. Graefe's Arch.*, xxxviii.

Discission before the discharge of the patient was necessary in 45 cases: in 36 after uncomplicated, in 9 after complicated, extractions. Thirteen discissions were made at a later period: 1 was complicated with glaucoma, another with iritis; in the other 11 cases, the capsule had become thickened, the operations without any complications.

Professor Schoeler recommends the following safe method for discission: After the use of atropine, the cornea is opened with a small lance-shaped knife and the capsule carefully divided with a cystitome. The knife or needle enter more deeply into the vitreous; they also tear and pull more than the cystitome. The evacuation of the anterior chamber has never given rise to complications, although we must admit that the protruding vitreous might enter the corneal wound.

In extraction with iridectomy, where, after an iritis, the occluded pupil is drawn toward the section, the least injurious method would be to divide iris and secondary cataract with a cystitome, from below upward. v. Wecker's scissors cause a greater pulling of the membrane, enter the vitreous too far, and an iridectomy in the opposite direction causes bleeding in the anterior chamber, and often exudation, and the opening is apt to be closed again. The cystitome was used in only one instance for the discission of the secondary cataract and of the distinctly atrophic iris, but the iris was cut easily without pulling or bleeding, and the opening remained.

The results of extraction with or without iridectomy are nearly the same, especially when we take into account the final results of all the complicated cases (88.3 % against 89.2 %). The number of discissions, however, has been doubled in simple extraction (14.2 % against 7.7 %), and also the discissions which were made later (4.1 % against 2.2 %). These numbers remain far behind Knapp's[1] 50% discissions, but we must not forget that Knapp's peripheric capsulotomy requires discission more frequently. Knapp certainly does not see any drawback in the greater frequency

[1] ARCH. OF OPH., xvii., xviii., xix.

of discission; on the contrary, an advantage in the increased acuteness of vision.

The number of cases of prolapse is reported by Knapp as 8.6 %, by Greeff [1] as 7.9 %, in our own series we have 6.3 %, with only one failure, which may be still improved by an operation. The cases of prolapse will have to be observed for years, since infection through the incarcerated prolapse and loss of the eye may occur after years (one loss reported by Greeff).

The indication for iridectomy, when not by accidental complications (glaucoma, preceding iritis), appears to be mainly in an abnormal position of the pupil after the operation. We fully concur with Knapp in this point, but hold that iridectomy may be omitted, when the iris has been but slightly injured, and when the pupil is round. Greeff recommends iridectomy, when we have to expect coughing, vomiting, or great restlessness of the patient. While Greeff advises iridectomy when prolapse of vitreous may be expected (in high degrees of myopia) since prolapse of vitreous favors prolapse of iris, we believe that the omission of iridectomy is an advantage, in avoiding prolapse, and that the operation should be finished as rapidly as possible. The intact iris is a barrier against the vitreous, and this explains the smaller number of cases of prolapse of vitreous (2.8 % against 6.5 %). On the other side we must admit that prolapse of vitreous will eventually produce prolapse of iris. This accident occurred in three cases of hyper-mature cataract, in which normal vitreous pressed the iris into the wound, and the eye had to be bandaged at once. In two of these cases a piece of iris was incarcerated in the wound, and in one we had subsequently infection and sympathetic inflammation.

General diseases, for instance, diabetes, are in otherwise normal eyes no indication for iridectomy. We have four simple extractions in diabetes mellitus, with smooth operation and normal healing. In one extraction of a diabetic cataract which has not been reported in this series, with preparatory iridectomy, complicated with an old iridocylitis, the eye was soon lost.

[1] Report of Schweigger's clinic, ARCH. OPHTH. ?

FOREIGN BODY TOLERATED IN THE BACKGROUND OF THE EYE.

By Dr. A. ELSCHNIG.

Abridged, translated from vol. xxii., pp. 113–118, 1891, of German edition, by H. Knapp.

S. C., blacksmith, thirty-nine years, felt, December 11, 1887, that, while he was striking a piece of steel with a heavy hammer, a detached particle flew into his right eye. His sight at once diminished, everything appeared yellow, and black patches appeared before him. Some blood flowed from a small wound on the temporal side of the eyeball.

On the patient's admission to the hospital, January 12, 1888, a triangular scar, 3 *mm* long, was found 2 *mm* behind the temporal border of the cornea. From it black streaks radiated through the vitreous. Black flakes were between them and in other parts of the vitreous. O. d. slightly congested. A dark-brown patch, $1\frac{1}{2}$ Pa-D (papilla-diameter) long, 1 Pa-D wide, was situated somewhat beyond and above the yellow spot, surrounded by a bright white seam. Glittering mica-like scales floated in the surrounding portion of the vitreous. S $\frac{6}{24}$. Large paracentral scotoma. Below the dark-brown patch there is a black, sharp-edged body (a piece of steel), which moves somewhat during the examination.

Jan. 14th and *16th.*—The foreign body is turned 90°, later 120° on its longest axis; surrounded by delicate fibrous tissue.

Jan. 24th.—Foreign body very indistinct; covered with a whitish coat on all sides except above, where a sharp edge of it is free. There was no irritation. Patient discharged.

Seen again Feb. 5th, after having resumed his heavy work.

Seen again Jan. 1, 1890, two years after accident. Never the slightest trouble from his eyes. Eye looks healthy. A thin cord

passes from point of injury into the vitreous, dissolving into fine fibres. The optic disc like the other. The foreign body is situated in the plane of the retina, its longest diameter vertical, its edges free and sharp, its anterior surface covered with white fibrous substance projecting into the vitreous. S $\frac{6}{12}$. A sector-like defect in the upper inner part of F, separated by an obscured zone from a paracentral scotoma.

In this case we had to deal with a piece of steel which entered the globe in the ciliary region, passed through the vitreous, struck the retina beyond and above the yellow spot, became loose, and sank down to a lower place in the vitreous. There it was united to the retina by new-formed connective tissue. Two years later it was found in the same position. The sight of the eye was reduced to one half of the normal standard by changes in the retina and opacities of the vitreous.

EXTRACTION OF CHIPS OF IRON IN THE VITREOUS.

By Dr. ERNST FISCHER, Dortmund, Prussia.

Abstract from vol. xxii., of Germ. ed., pp. 18–24, 1891, by H. Knapp.

In the very industrial Prussian provinces of the lower Rhine, iron injuries are very frequent. In the years 1886 to 1889 seventeen cases of iron in the vitreous came to my notice and care in Dr. Mayweg's practice.

Two of the seventeen cases, extracted with the electro-magnet, obtained permanently good vision: the one, $\frac{20}{30}$; the other, $\frac{20}{100}$.

Of the remaining ten cases in which we succeeded in drawing out the foreign body with the electro-magnet, one eye was lost by panophthalmitis, though the operation was done as early as twenty-four hours after the injury. The little splinter had flown into the vitreous through cornea, iris and lens. When a scleral incision had been made, the magnet was applied to the outer surface of the sclerotic, and the foreign body at once attached itself to the iron nucleus.

A fourth and a fifth case required subsequent enucleation, the sight being destroyed and the irritation persisting.

Case six saw movements of the hand excentrically.

Cases seven to twelve executed fingers from 2–8′, their field mostly being defective.

In the remaining five cases the introduction of the magnet failed to fetch the foreign body.

[The author concludes with some considerations on the diagnosis of the presence of foreign bodies in the eye.]

FOREIGN BODY ENCAPSULED IN THE RETINA, WITH PRESERVATION OF VISION.

By Dr. Fr. HOSCH, in Basle.

Abstract from vol. xx., p. 265, of Germ. ed., 1889, by H. Knapp.

SINCE Knapp in the year 1882 (Arch. of Ophthal., xi., p. 222) compiled the recorded cases of foreign bodies tolerated in the background of the eye with preservation of good sight (twelve cases in all, one by Schiess, published in *Mon. f. Aug.*, 1880, p. 383, having been overlooked), no new case has come to my notice. The following case of my own observation may be of interest.

A girl of twenty-four years while hoeing vines felt that something flew in her right eye. Her physician discovered no foreign body. No pain or inflammation ensued. The slight cloudiness of sight disappeared soon and the patient forgot the accident.

Nine months later the patient accidentally noticed that the sight in right eye was not so good ($\frac{15}{200}$) as in the left ($\frac{20}{20}$). A small scar was found at the inner-upper border of the cornea, a small hole in the iris behind it. A black, in some places lustrous, foreign body stuck in the lower-outer part of the retina, surrounded by a yellowish-white bright border. Near it there were some irregularly scattered black and yellow patches. The remaining portion of the fundus normal. The foreign body measured 1.25 disc-diameters in its longest dimension. The eye having remained quiet so long, I abstained from any attempt to remove the foreign body, though I am aware that such bodies may work loose at any time and necessitate the enucleation of the eye.

SIXTY-SIX MAGNET OPERATIONS, WITH SUCCESSFUL EXTRACTION OF PARTICLES OF IRON FROM THE INTERIOR OF THE EYE IN FIFTY-THREE CASES.

By Dr. HENRY HILDEBRAND, of Hagen, Prussia.

Abridged, translated from Germ. ed., vol. xxiii., pp. 278–322, 1891, by H. Knapp.

DR. MAYWEG, of Hagen, whose assistant the writer is, has made 66 magnet operations during the years 1879–90. Some of these were reported by Dr. Fischer. In 53 cases the attempts to extract the iron splinters were successful, in 16 of which good vision was preserved. After detailing the cases, I shall comprehensively discuss the experience gained from so large a number of operations.

As everything of importance is contained in the comprehensive remarks, the translation omits the clinical histories of the 66 cases, some of which are given very extensively, others only in a few lines.

In 15 cases the foreign bodies were lodged in the anterior chamber, iris, or lens. The operations took a favorable course in all but one, where severe purulent inflammation had existed before the operation.

In 51 cases the iron splinters lodged in the vitreous chamber. In 13 no foreign body was extracted. Of the 38 in which the foreign bodies had been extracted, the following results were obtained:

Two led to enucleation; seven, to phthisis bulbi.

Six were lost sight of.

Seven preserved the shape of the eye.

Sixteen yielded a good result, more or less good vision being permanently restored.

Cases which on discharge had tolerably good sight, but soft eyes or notable turbidity of the vitreous, were not counted among the successes, for these cases are apt to become worse later by detachment of the retina or shrinkage of the globe.

All operations, except the first eight, were performed with a Hirschberg electro-magnet, connected with a storage battery. In most cases this instrument was proved sufficient; in some, however, a stronger magnet would have been desirable. The magnet should be introduced as near the foreign body as diagnosis and position permit; churning of the vitreous should be avoided. Local anæsthesia by cocaine was preferred to general anæsthesia.

In determining the location of the foreign body, it is to be borne in mind that the anterior limit of the ophthalmoscopic field of vision is eight *mm* behind the margin of the cornea (Grœnouw, Mayweg). Distances from this limit farther back can be measured by papilla-diameters, 1.4 *mm* each.

The incision into the tunics of the eye is meridional, made with a narrow knife, after separation of the conjunctiva with a pair of scissors. The incision is dilated during the withdrawal of the knife.

Thin and pointed electrodes are to be avoided; thicker ones, with a wedge-shaped tip, to be preferred.

Indications. Whenever an iron foreign body in the interior of the eye is recognized with certainty, its extraction is indicated. Even such foreign bodies as seem firmly attached to the background, and cause neither irritation nor impairment of sight, are better out than in, for they are liable sooner or later to work loose and prove troublesome and dangerous. If they can be seen, their removal is commonly easy and practically free from danger.

It is advisable to operate *as soon as the presence of the foreign body can be ascertained.* Even if the foreign body cannot be seen or otherwise located, its removal should be attempted whenever it causes a severe inflammation.

The possibility in such cases to preserve not only the shape of the eye, but full acuteness of sight, is proven by a case described as No. 9 in the clinical histories. Severe inflammation, intense pain, complete turbidity of the vitreous, and almost total loss of sight were present. Yet so excellent a result was obtained by the operation that a short time ago, on examining the patient's eyes (seven years after the operation), I could not distinguish which was the affected one.

If it is impossible to locate the foreign body, it is mostly safer to wait until the media have cleared than to stir the vitreous extensively.

In one case (No. 59) the foreign body had produced a cataract which was extracted three months later, and the foreign body which was now seen at the bottom of the vitreous, easily extracted, though it had lain three months in the vitreous.

The *diagnosis* of the presence of a foreign body is of the greatest importance. The history of the injury, the instrument from which the piece flew off, and which should if possible be examined, will aid us considerably. The *passage of entrance* shows with respect to frequency of occurrence the following varieties:

(1) directly through the sclerotic,
(2) through cornea, iris, and lens,
(3) through cornea, iris, and zonula Zinnii, without injuring the lens,
(4) through cornea and lens, without injuring the iris.

Air-bubbles, sometimes seen in the vitreous (three times by the translator), are a sure sign of the presence of a foreign body in the eye. They are mostly in the upper part of the vitreous.

If the vitreous is more cloudy in the lower part than in the upper, the patient should be examined in different positions of the head. In one of our cases the foreign body was distinctly, and then only, visible when the patient was standing on his head. It was successfully extracted.

The magnet itself is in some cases a serviceable means of localizing the foreign body. When passed over the sclera,

no tenderness or pain is felt except when the electrode is in immediate vicinity of the foreign body. As soon as it is moved from this point, the pain disappears.

If a small wound of the conjunctiva has been produced by a foreign body, Dr. Mayweg examines the wound with a platinum wire made aseptic by glowing (the translator with the conical probe which is used for dilating the lachrymal puncta), in order to determine whether the sclera is perforated or not.

We should not omit, however, to mention that in spite of all care the diagnosis of a foreign body in the eye is often very difficult and sometimes impossible.

Prognosis. Adding our 66 operations to those I was able to find in literature, we obtain 322 cases in which the magnet has been introduced into the eye. In 80 the foreign body lodged in the anterior part, in the others in the vitreous.

Of the 80 cases, 13 ended unfavorably, on account of purulent inflammation which had set in before the operation. Seventy-seven cases yielded a perfect result.

When the foreign body is located on or in the iris, Mayweg uses a flat electrode, shaped like a bent iridectomy knife, introduces it into the anterior chamber before closing the current, touches and eventually loosens the foreign body with it, then closes the current and extracts the chip. In this way prolapse of the iris is better avoided than by using a round electrode.

In 74 of the 248 cases in which the magnet was introduced into the vitreous, the foreign body was not found.

In 174 cases the particles of iron were extracted.

Twenty-three of these (13 %) led to phthisis bulbi.

Twenty-six, *i. e.* 15 % necessitated subsequent enucleation.

Of 34 cases the results could not be obtained, because the records were either defective or not accessible to me in the original.

The remainder, 91 cases (52 %), gave satisfactory results, namely:

Twenty-nine cases (16 %), preservation of the shape of the eye.

Sixty-two cases (36 %), more or less good vision.

These results being permanent, it is evident that the introduction of the magnet operation into ophthalmology has been a great benefit to many unfortunate persons.

When the above article was finished, I received the newest publication of Hirschberg: *The Results of the Magnet-Operation in Ophthalmology.* On the whole, Hirschberg's experience agrees very well with ours; in two points only there is material difference.

First, Hirschberg considers general anæsthesia essential during the operation, whereas Mayweg believes local anæsthesia (cocaine) to be fully as good and much more convenient.

Secondly, Hirschberg recommends immediate explorative probing with a pointed electrode through the original wound. Mayweg introduces the magnet, apart from cases in which severe inflammation is present, only when the foreign body can be diagnosticated with certainty, and its seat determined. In case this was not possible he waited, except when intense inflammation was present. Probing with the magnet through the primary wound has been done by Hirschberg 39 times, and in only 3 times did he succeed in detecting and extracting the foreign body.

Comparison of the results of Hirschberg and Mayweg are in favor of Mayweg. In his 100 operations, Hirschberg includes 21 where the foreign bodies had been situated in the sclera and cornea. Such cases, as too insignificant, have not been counted by Mayweg.

Hirschberg introduced the magnet into the vitreous in 65 cases, Mayweg in 51. Iron particles were extracted by Hirschberg in 29 cases (44 %) only, but by Mayweg in 38 cases (74 %).

The visual results obtained by Mayweg are likewise better. In 16 cases (31 %), good vision was obtained (normal S in 2 cases, S $\frac{2}{3}$ in 1), by Hirschberg in 7 cases (10 %).

ON THE TOLERANCE OF FOREIGN BODIES IN THE BACKGROUND OF THE EYE.

By H. KNAPP.

SINCE I published the article on "Foreign Bodies Tolerated in the Background of the Eye, with Preservation of Good Sight,"[1] quoted in the preceding papers of Hosch and Elschnig, in which I communicated one case from my own practice and twelve from literature, several others have come under my care. I have before me drawings and notes of three of them. One is published in vol. xxi. of these ARCHIVES (p. 362, 1892). The eye had been struck with a piece of iron flown off from a chisel. It remained irritable, inflamed, and dim for two months, then quieted, and the sight cleared. I saw the patient three months after the accident; eye free from irritation, S $\frac{20}{30}$, the piece of steel near the optic disc. The eye remained quiet for five months more, then detachment of the retina set in. The eye was enucleated.

In the second case a small chip of iron was accidentally discovered with the ophthalmoscope. It was situated two Pa.-D.D. below the optic disc; measured half the size of the optic disc; sight was perfect; the patient knew nothing of its existence, but the ophthalmoscopic picture was so characteristic that the diagnosis admitted of no doubt.

The third case which I shall describe more in detail, refers to a

Foreign body tolerated in the background of the eye an unknown period, observed a year, then working

[1] These ARCHIVES, vol. xi., p. 222, 1882.

loose, producing irido-choroiditis, which required enucleation.

John Quattländer, 324 S. 4th St., Brooklyn, æt. forty. He consulted me August, 1882, on account of dilatation of the pupil and some dimness of the left eye. A carpenter by trade, he hammers a great deal, driving nails, cutting iron with a cold chisel, of which, he says, pieces frequently fly off. He was aware that his eye was

hit now and then, but never noticed any particular injury from it. The eye never inflamed.

When examined the pupil was found 8 *mm* in diameter, that of the right eye 5 *mm*; both movable. S R $\frac{20}{20}$, L $\frac{20}{40}$. Left pupil at times became small. Defect in upper-outer part of F. Reads fine type with either eye. Media transparent, with exception of the lower-inner quadrant in which a string of white, shining little flakes float in the vitreous, apparently reaching near the posterior pole of the lens. This string is connected with an oval ring-shaped, white band of irregular width at the background of the

eye, containing in its centre a sharply defined, gray-lustrous fragment, presenting a sharp edge of 1.5 Pa.-D., and almost right angles at its upper end (see accompanying figure), which projects uncovered into the vitreous, looking exactly like broken steel, or he broken surface of pig-iron. It is directed obliquely backward, and its lower part, which sticks in the sclerotic, is covered with a dull white fibroid mass. The breadth of the uncovered part is 0.25 Pa.-D.

Close external inspection of the eye shows no opacity, scar, or other abnormity in sclerotic, cornea, iris, or lens. The retina is in position everywhere, and normal. Below the foreign body there is a patch of maceration of pigment. The crest of the foreign body, looked at with the ophthalmoscope in the erect image, is distinct with $+\frac{1}{8}''$, the background of the eye emmetropic, from which it follows that the foreign body projects about 1 *mm* over the retina.

The patient had no trouble for a year. On August 12, 1883, he came again, stating that for the last three weeks the eye had been inflamed and the sight dim. He had iritis with a narrow pupil. S = $\frac{5-6}{200}$. Interior turbid. The seat of the foreign body could be seen, but the foreign body itself had left it. Some white small particles moved through the vitreous. Leeches, rest, atropine.

August 15th.—Circumcorneal injection less, no pain. S = $\frac{20}{70}$.

August 17th.—S = $\frac{30}{200}$. More turbidity of vitreous. Visual field narrowed around point of fixation. Pupil medium wide. Iris greenish-yellow. Anterior surface of lens irregularly studded with cinnabar-colored points of pigment having the apparent diameter of millet-seeds; between them were smaller, darker spots. Fundus hazy.

Diagnosis irido-choroiditis, from foreign body in vitreous.

The eye was enucleated August 17th. No reaction.

Patient discharged August 21st.

These cases show again that foreign bodies in the background of the eye, though apparently tolerated, can never be trusted. If they are small and the accompanying changes trifling, or absent as in the second case cited above, the tolerance may be absolute and permanent. Under other circumstances the foreign bodies are liable to cause irritation and degenerative inflammation, necessitating the removal of the eye.

In two other cases fragments of iron had entered through the cornea and lens, producing cataract. Though both eyes were free from inflammation, I did not attempt to search for the foreign bodies with a magnet needle, but kept the patients in the hospital and let them lie in bed as quiet as they could for three weeks. I put my whole hope in capsulation of the foreign bodies and obtained it. The other eye in each patient had been lost. When the cataracts, in the course of months, had become ripe, I extracted them successfully, and the patients for several years presented themselves from time to time. No foreign body could ever be seen in either, but the eyes had remained healthy and sight good.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE FIRST AND SECOND QUARTERS OF THE YEAR 1893.

(*Continued from p. 554, of vol. xxii.*)

By Dr. ST. BERNHEIMER, in Vienna; Prof. C. HORSTMANN, in Berlin; and Dr. SILEX, in Berlin;

WITH THE CO-OPERATION OF

Dr. S. M. Burnett, Washington; Dr. Dantone, Rome; Prof. Hirschmann, Charkow; Dr. P. von Mittelstädt, Metz; Dr. Werner, Dublin; Dr. C. H. A. Westhoff, Amsterdam; Dr. Schiötz and Dr. Ole Bull, Christiania; Dr. Deus, Berlin; Dr. Herrnheiser, Prague; Dr. Sulzer, Geneva; and others.

Sections XII.–XXI. Reviewed by Dr. P. SILEX.

Translated by Dr. Ward A. Holden.

XII.—IRIS.

1. Burchard. On iritis. *Centralb. f. pr. Augenhk.*, xvii., p. 169.

2. Oliver. The exact correction of refractive errors in plastic iritis. *Ann. d'Ocul.*, cix., p. 5.

3. Oliver. The clinical value of the repeated careful correction of manifest refractive errors in plastic iritis. *Trans. Amer. Ophth. Soc.*, 1892.

4. Morax. Rare forms of iritis. Iritis in the course of psoriasis. Recurrent gonorrhœal iritis. *Ann. d'Ocul.*, cix., p. 369.

5. Knaggs. Case of tuberculosis of the iris, the suspensory ligament, and the retina. *Trans. Ophth. Soc. Un. K.*, xii., p. 79.

6. QUINT. Creosote in tubercular iritis. *Centralb. f. Augenheilk.*, xvii., p. 67.

7. BULL, C. S. Gonorrhœal irido-choroiditis. *Annals of Ophth. and Otol.*, April, 1893.

8. ALT. Two cases of gonorrhœal iritis. *Amer. Journ. of Ophth.*, January, 1893.

9. KEYSER. Iridectomy necessary fourteen days after normal extraction of cataract. *The Ophth. Record*, March, 1893.

BURCHARD (1) calls attention to the minute dots on the anterior capsule of the lens, which can be recognized with the loupe in every form of iritis. They probably are composed of pigment granules from the posterior surface of the iris or the ciliary body.

In many cases of plastic iritis, Oliver (2) has found fluctuations of the subjective astigmatism and changes in the curvature of the cornea. He thinks that there is a spasm of the ciliary muscle, and advises observing the effect of the mydriatic by the repeated careful examination of the refraction, varying the use of the mydriatic according to the condition of the refraction.

MORAX'S (4) patient, aged thirty-seven, showed a psoriasis distributed over the entire body, and iritis of the right eye. The first eruption came on at the age of twenty-six with simultaneous pain in the joints, and was cured by the use of ol. cadini. Two years later there was a relapse. Five years after the first eruption there was another eruption of psoriasis over the entire body, and the accompanying articular affection showed from the beginning a deformative character. At the same time there was disturbance of sight, injection of the eyes, and severe periorbital pain. The affection of the eyes was recovered from in two weeks, without local treatment. The psoriasis was cured, but the affection of the joints was not.

February 5, 1893, there was a recurrence of the eruption with pain in the right eye. February 13th, Morax found a severe iritis in the right eye, with perikeratic injection, turbidity of the aqueous, discoloration of the iris, no hypopyon or synechiæ. Two days after atropine had been used, numerous pigmented deposits were found on the anterior capsule. There was no history of syphilis. Morax believed that the case was one of psoriasis arthropathy, since the characteristic signs of this were present. Affection of the joints in psoriasis is frequent, but iritis has not been described in connection with it.

The second case was one of recurrent blennorrhoic iritis of long standing. The patient, aged thirty-five, had gonorrhœa at the age of twenty. Eight days after the beginning of the discharge the right knee became affected, and iritis developed in both eyes. The case recovered in a month, but there have been yearly recurrences since. The chronic urethritis has lasted equally long. SULZER.

KNAGGS' (5) patient, aged nine months, of phthisical parentage, had an iritis with pale red nodules on the iris, one of which perforated the corneal margin. The patient died of tuberculosis. WERNER.

QUINT (6) prescribed 0.3–0.75 gram. of creosote daily, and obtained immediate improvement in two cases of tubercular iritis that had been treated for a long time without result. The chronic cases of iritis, with numerous deposits on Descemets' membrane, are frequently of tubercular nature.

BULL (7) reports the histories in full of two cases of gonorrhœal irido-choroiditis. The symptoms in these cases are always severe and alarming, but Bull thinks the prognosis more favorable than in the simple rheumatic form.

BURNETT.

ALT (8) relates two cases of iritis occurring in patients suffering from gonorrhœa. In one case gonorrhœal conjunctivitis and ulcer of the cornea preceded, but had been cured before the attack of iritis. In both there was articular rheumatism.

BURNETT.

KEYSER (9) reports two cases in which after a normal extraction the iris began to protrude on the second and fourth days, and increased so as to be total on the twelfth and fourteenth days respectively. The prolapse was snipped off and the eyes did well. BURNETT.

XIII.—CHOROID.

10. DARIER. A case of central choroiditis, in which the vision was brought up to the normal by the subconjunctival injection of sublimate. *Soc. de opht. de Paris*, Feb. 7, 1893.

11. GRADLE. The clinical history of central circumscribed chorio-retinitis. *Annals of Ophth. and Otol.*, Jan., 1893.

DARIER'S (10) patient, aged twenty-two, had suffered for a year with a macular affection of non-specific nature. Inunction of mercurial ointment, and the internal use of iodide of iron for

three months did not check the progress of the disease, and vision became reduced to $\frac{1}{4}$. Ten subconjunctival injections of sublimate increased this to $\frac{2}{3}$, and after this treatment was resumed a month later vision became normal. Some metamorphopsia remained, due to an atrophic patch near the macula. Despagnet believed that the favorable result might be attributed to the inunction as well as to the injection; Vignes had not obtained better results by injection than by inunction; while Vacher considered the latter the more efficacious. Darier reported several other cases, in which subconjunctival injections had been followed by good results. In two cases there had been no other treatment.

GRADLE (11) gives the histories of three cases of a rare form of disease, which he designates as central circumscribed chorioretinitis, and which offers some points of difference from the ordinary form of choroiditis. It is not syphilitic, appears rather suddenly, and passes off in from three to six weeks, leaving a blur, but no clearly marked scotoma. Serous iritis is nearly always associated with it The retinal vessels are intact, and it is always unilateral. He is inclined to think it may be due to infection. BURNETT.

XIV.—GLAUGOMA.

12. CRITCHETT. A case of double subacute glaucoma in a patient aged twenty-nine. *Trans. Ophth. Soc. Un. K.*, xii., p. 86.

13. STORY. Cases of glaucoma in young people. *Ophth. Rev.*, xii., p. 69.

14. DE BOURGON. Considerations on the treatment of hemorrhagic glaucoma. *Ann. d'Ocul.*, cix., p. 111.

15. SAMELSOHN. On syphilitic glaucoma. *Soc. franç. d'opht.*, May, 1893.

16. AYRES, S. C. Glaucoma in a girl eighteen years of age. *Amer. Jour. of Ophth.*, Jan., 1893.

17. BJERRUM. On the visual field in glaucoma.

In CRITCHETT'S (12) case the attack was referred to emotional causes. The vision was reduced to perception of light, and the pupils did not react to eserine. An iridectomy was made fourteen days ofter the beginning of the attack. The vision increased to $\frac{10}{100}$ and Jaeger 16 in the course of a year. WERNER.

STORY (13) reported the following cases:

1. Acute glaucoma after the subconjunctival injection of cocaine in a girl of fifteen. A tenotomy was made after the injection of cocaine, the pupils were dilated with atropine, and two hours later acute glaucoma developed, which yielded to repeated instillations of eserine. A month later the other eye was operated in a similar way, eserine being instilled instead of atropine. Glaucoma supervened as before, and yielded to eserine instilled four times within an hour.

2. Chronic inflammatory (?) glaucoma in a girl of eighteen.

3. Acute glaucoma in a woman of thirty-five.

4. Chronic inflammatory glaucoma in a man of thirty.

5. Chronic inflammatory glaucoma complicated with keratitis punctata in a man of thirty.

Story measured the diameter of the cornea in 31 cases of glaucoma, and found it to be on an average 11.9 *mm*, or 0.3 *mm* greater than the average diameter found by Priestley Smith.

WERNER

Starting from the idea that true hemorrhagic glaucoma, in which the increased tension is produced secondarily to the retinal hemorrhages, is dependent upon diseases of the vascular system, BOURGON (14) draws the following conclusions:

1. The prognosis of true hemorrhagic glaucoma is very bad. Enucleation is often unavoidable.

2. All operations excepting sclerotomy, are contra-indicated.

3. The prognosis is equally unfavorable for the general condition and for the local affection. The oculist should never neglect to call the attention of the family physician to the condition of the vascular system.

4. In the hemorrhagic stage the indications are to care for the general condition, and to prevent hyperæmia of the eyeball by laxatives, diuretics, diaphoretics, diet, exercise, and hydrotherapy.

In the glaucomatous stage myotics, moist warm applications, and injections of ergotin should be used.

SAMELSOHN (15) observed two cases of glaucoma in which syphilis was the primary cause. In the first patient, iridectomy was made in acute glaucoma. The immediate effect of the operation was good, but a month later the patient had a second attack. As this seemed suspicious, a careful examination was made, revealing the presence of syphilis, and the general treatment led to a complete recovery.

His second case was analogous.

Samelsohn believes, therefore, that syphilis, in certain cases, may lead to acute glaucoma, through arterial sclerosis of the uveal tract. Iridectomy acts for a time in a mechanical way, but general treatment only can lead to permanent recovery.

Parinaud observed a bilateral glaucoma in an eighteen-year-old girl with syphilis. Iridectomy relieved the tension for a time, but the vision remained poor. The ophthalmoscope showed the presence of a specific chorio-retinitis with atrophy of the retinal vessels, in consequence of arterio-sclerosis.

In a patient with specific chorio-retinitis and atrophy of the optic nerves, Chibret cured a bilateral increase in tension by mercurial treatment, without operation.

Meyer believed that attacks of glaucoma in the young should always lead us to search for syphilis. It is questionable whether iridectomy is indicated in these cases.

AYRES (16) reports a case of idiopathic glaucoma in a girl of eighteen years. The immediate symptoms were subdued by eserine. BURNETT.

BJERRUM (17) reviews first the different opinions of authors in regard to glaucoma simplex, which some class with the glaucoma group, while others (Schweigger) regard it as a particular disease—amaurosis with cupping of the optic disc. Referring to his method of testing the visual field with very small objects (*Nord. Ophth. Tidskr.*, ii., 3), he shows by a series of clinical examinations that the visual field in true glaucoma exhibits typical peculiarities, and that these are also found in glaucoma simplex without increased tension.

The peculiar feature common to all diseases having "glaucomatous" cupping is the relation which the affected and unaffected portions of the field bear to the blind spot. Most frequently an absolute or relative defect is found in the upper or lower half of the field in the form of a sector, with its apex at the upper or lower margin of the blind spot. Usually the base of the defective sector is inward, and the apex extends in an arched prolongation above or below the point of fixation to the upper or lower margin of the blind spot.

The topographical relations of the field give on the whole an accurate picture of the radiation of the nerve fibres from the papilla out into the retina. It is usually the fibres running upward or downward that are affected, and these extend in an

arc above or below the macular region to reach the temporal portion of the retina. The function of the retina is best preserved just external to the blind spot and internal to this about the point of fixation. The central scotoma in glaucoma is usually a small paracentral arc-shaped scotoma, whose concavity is directed toward the point of fixation, and which ends at the blind spot. At times there is a scotoma which occupies the entire macular region up to the inner margin of the blind spot. The portion of the field best preserved has often the form of a crescent, the blind spot lying at its concave margin. At a later stage this preserved portion of the field often contracts to a small, nearly circular patch, lying just above or below the blind spot.

The visual field in atrophy never shows such relations. According to Bjerrum, amaurosis with excavation of the disc must be considered glaucoma simplex. SCHIÖTZ.

XV.—SYMPATHETIC OPHTHALMIA.

18. DEUTSCHMANN. Continued experiments and investigations on ophthalmia migratoria. *Beiträge zur Augenheilk.*, x.

19. GREEFF. Bacteriological investigations on the origin of sympathetic ophthalmia. These ARCHIVES, xxii., p. 298.

20. LOGETSCHNIKOW. Contributions to the study of sympathetic ophthalmia. *Wjest. Ophth.*, 1893, i.

21. KALT. A case of sympathetic ophthalmia. *Soc. franç. d'opht.*, 1893, May.

After discussing the many criticisms of his theory, DEUTSCHMANN (18) reports some surprising facts in regard to a case of resection of the optic nerve. The margins of the cut, separated at first by blood, were soon united by a delicate connective tissue, and injections of India ink showed that there was a lymph current from the brain to the eye, passing without great difficulty through the new connective tissue. Micro-organisms could also pass in the same way, and thus he explains those cases of sympathetic ophthalmia which came on long after resection of the optic nerve, at a time when the injured eye was entirely free from irritation. The dormant micro-organisms excite a fresh inflammation, and notwithstanding the resection pass to the second eye. He reports five new cases where bacteria were found in the eye. The negative results of others may be explained by the fact that the cases were not ones of sympathetic ophthalmia, or by the fact

that the microbes in degenerated eyeballs may not stain by the customary methods, or because they had left the ball and were to be found in the nerve. They might also pass from the outer surface of the ball through Tenon's space into the intervaginal space. In 35 inoculations in recent years he obtained positive results twice, and Parisotti 8 times in 30. The view that the presence of cocci in the sheaths of the optic nerves is a symptom of general infection, is disproven by the fact that when a general infection was produced he never found the sheaths of the optic nerves affected. Such a condition might be possible in meningitis, but none of his rabbits had meningitis. He describes also a case of sympathetic ophthalmia in a man where both eyes and the optic nerves in their entire course contained short rod-shaped micro-organisms, resembling gonococci.

GREEFF (19) in 3 cases of well marked sympathetic ophthalmia found no microbes in the ball or optic nerve, while Deutschmann claims to have found them 16 times in 17 cases. The optic nerves of 14 eyes that were removed for fear of sympathetic ophthalmia all gave negative results. He was not able to obtain positive effects from inoculation. Micro-organisms and inflammatory changes were found in the second eye only when there had been general infection, from all of which he concludes that Deutschmann's theory is by no means proven.

LOGETSCHNIKOW (20) observed a case of rupture through the conjunctiva and sclera above and to the nasal side of the cornea in the right eye, with coloboma of the iris and luxation of the lens. Fifteen days after the injury there developed in the left eye an iritis with synechial deposits on Descemet's membrane, hypotony and reduction of vision to $\frac{1}{3}$. Sublimate and cocaine were used at first in the right eye, and later atropine in the left, and subcutaneous injections of pilocarpine with good results. After seven mos. R, with $+3\frac{1}{4}$, V=$\frac{4}{5}$, L. vision normal. Logetschnikow utiltizes this case to disprove Deutschmann's theory.

In the case of KALT (21) the left eye of a girl of nine years had been injured with the point of a pair of scissors at the sclero-corneal border. When seen three weeks later, there was a small non-irritative prolapse of the iris. S. good. Kalt, yielding to the desire of the parents, tried to remove the small tumor, incising it, drawing forward and abscising the iris. Two days later, the still protruding iris was treated with galvano-cautery. Seven days later pericorneal injections and many fine synechiæ of the

other eye. The vitreous of both eyes hazy and the optic discs congested and swollen. S. diminished in both. Galvano-cautery of the prolapse renewed and subconjunctival injections of a small quantity of corr. subl. made. Recovery of both eyes with good vision. Kalt considers the case as one of spontaneous recovery of sympathetic ophthalmia. H. KNAPP.

XVI.—VITREOUS.

22. HIRSCHBERG. On the so-called tubular encapsulated cysticercus in the vitreous. *Centralbl. f. Augenh.*, xvii., p. 135.

23. LAWFORD. Notes of a case of subhyaloid and vitreous hemorrhage. *Ophth. Review*, xii., p. 105.

24. SGROSSO. Synchysis scintillans and spintheropia. *Ann. di Ottalm.*, xxii., pp. 1-53.

According to HIRSCHBERG (22) the cases reported were not ones of cysticercus but of congenital malformation in the vitreous. In all these cases there is a lighter coloring of the iris; and a bluish tube extends from the region of the disc, where pigment anomalies are always found, forward through the vitreous. Posteriorly it is attached to the retina by fibrous membranes, anteriorly it spreads out and is inserted into the posterior surface of the lens. The question is whether it is a persistent hyaloid artery, open or obliterated, a visible canal of Cloquet, or a combination of both.

The unusual features of LAWFORD'S (23) case was the complete recovery of a woman aged sixty, after a central hemorrhage into the retina. Sixteen days after the retinal hemorrhage there was hemorrhage into the vitreous. WERNER.

SGROSSO (24) gives a detailed clinical and anatomical description of synchysis scintillans as seen in two eyes enucleated for this affection, and comes to the following conclusions. The phenomenon of sparkling does not depend upon the presence of cholesterine only, but also of tyrosin, phosphates, and margarin salts. In each case there were fat crystals and calcium salts present, besides chronic inflammation and degeneration of the internal ocular membranes and the transparent media. DANTONE.

XVII.—LENS.

25. SCHOEN. The functional diseases of the eye. Cause and prevention of cataract and glaucoma. With atlas of 24 plates. Wiesbaden, Bergmann, 1893.

26. Hess. On the pathology and pathological anatomy of the various forms of cataract. *Graefe's Arch.*, xxxix., p. 183.

27. Peters A. On the genesis of lamellar and allied forms of cataract. *Ibid.*, p. 221.

28. Gillet de Grandmont. A case of extraction of a black cataract. Spectroscopic analysis. *Arch. d'opht.*, xiii., 5, p. 273.

Snellen. On the after-treatment of cases operated on for cataract. *Third Meeting of the Ophthalmic Society of the Netherlands*, 1893.

30. Fage. Severe intraocular hemorrhage after the extraction of a cataract. *Ann. d'Ocul.*, clx., p. 266.

31. Terson. The operation of congenital cataract. *Boll. d'Ocul.*, xv., 5. (Translation of a lecture by Panas. *Progrès Méd.*, Feb. 18, 1893).

32. Fuchs. The new method of cataract operation. *Wiener klin. Wochenschr.*, Nov. 2, 1893.

33. De Wecker. Historic reminiscences concerning the extraction of cataract. *Arch. d'opht.*, xiii., 4, p. 212; and 8, p. 260.

34. Czermak. Operations on the eye. 1st and 2d parts. Vienna, 1893.

35. Fergus, Freeland. Ten years experience of cataract operations. *Brit. Med. Jour.*, May, 1893, p. 997.

35 *a*. Pomeroy. Extraction of cataract without iridectomy. *Trans. Am. Ophth. Soc.*, 1892.

36. Essen, Frank G. Statistical reports of 94 cataract extractions performed at the New York Eye and Ear Infirmary. *N. Y. Eye and Ear Infirmary Reports*, part 1.

37. Mittendorf. On the frequency of posterior capsular opacities at the place of attachment of the hyaloid artery. *Trans. Amer. Ophth. Soc.*, 1892.

38. Bettman, Boerne. Ripening of immature cataracts by direct trituration. *Annals of Ophth. and Otol.*, Jan., 1893.

Schoen's (25) book contains a great number of anatomical descriptions and physiologico-pathological considerations to which an abstract would not do justice.

Hess (26) examined cases of cataracta centralis, zonularis (coincides with Schirmer's views), and punctata. The latter variety, though well known clinically, had not previously been

examined microscopically. The small punctate opacities represent elliptical spaces between the normal lens fibres, filled with homogeneous or very finely granular masses. The external layers of the lens are nearly or quite normal. In congenital punctate cataract the small cavities lie in the neighborhood of the nucleus, the fibres surrounding the cavities being irregularly notched. Punctate cataract, although an immature form, may be extracted.

PETERS (27) considers the formation of cavities in the nucleus as the anatomical underlying cause, and the shrinking of the nucleus as the cause of lamellar cataract. The shrinking of the nucleus does not only lead to the formation of a cleft at the periphery of the nucleus, but also to the formation of cavities and globules in the nucleus itself. He believes that it has been shown that a cortical layer exists at the time when the shrinking takes place.

GILLET DE GRANDMONT (28) extracted a cataract of deep black color. Sections showed the entire lens to be sclerosed and containing groups of hæmin crystals. Spectroscopic examination gave the spectrum of old alkaline hæmatin solutions. The black color of the cataract was due to an infiltration with altered blood-coloring matter, and not to a pigment infiltration.

V. MITTELSTÄDT.

SNELLEN (29) speaks chiefly of the operation without iridectomy. He uses no blepharostat, the lids being held apart with hooks, in order to avoid pressure. The after-treatment begins with the instillation of pilocarpine. The remnants of the lens must be carefully removed. For this, patience is required. One must wait until the aqueous re-forms, and then expel the remaining portions of the lens. The dressings should be changed after twenty-four hours. If there is no prolapse, atropine should be used. In order that the wound be not ruptured he puts an aluminum shell over the cotton, both being held in position by strips of plaster. WESTHOFF.

FUCHS (32), in simple extraction, makes the incision according to Wecker, instills eserine, and leaves both eyes bandaged three or four days, the patient remaining in bed three days, and usually being discharged in a fortnight. If all the indications are not favorable for the simple extraction, he makes an iridectomy—*i. e.*, when the pupil is very narrow, when the lens is swollen, when there are complications, when prolapse of the iris is feared, in

the debilitated, and when the patient has but one eye. He considers the operation with iridectomy as easier and safer. In 702 extractions there were 6 % of failures.

Dr. Wecker (33) sketches the development of cataract extraction as shown in the original treatises of Daviel and his contemporaries, preserved in the library of the Academy of Medicine in Paris, and also corrects many historical errors. He shows that, while there was a difference of opinion as to the best methods of opening the anterior chamber, Daviel preferring the lance knife and scissors, De la Faye and Béranger the ordinary knife, there was no dispute as to the size of the section. Contrary to the opinion advanced apparently by Guérin that Daviel cut two thirds of the circumference of the cornea, De Wecker shows that Daviel placed the end of his incision at the level of the lower pupillary margin, and carried the incision through the margin of the cornea, and not 2 *mm* from it. In the more important features the operation then scarcely differed from the present one. Neither Richter, Wenzel, Arlt, Sichel, or Desmarres made much alteration in the method of Daviel, De la Faye, and Béranger. The latter made his section almost exactly as Beer did later. There were variations made in the incision even at that time, and the horizontal section later ascribed to Küchler was employed by the monk Côme, in 1751, with very bad result. Then, as to-day, the rule was followed to make a large section in order to be able to remove the cataract easily and as completely as possible. Graefe's section did not fulfil this condition, and, although suppuration was less frequent when it was employed, more eyes were lost from iridochoroiditis. De Wecker believes that if antisepsis had come twenty years earlier, the old operation of Daviel would not have been given up, since, thanks to antisepsis, the present operation is in the main the same as that made in Daviel's day.

In the continuation of his paper, De Wecker refers again to the extent of Daviel's section, since Dujardin maintained that according to figures 1–4, plate i., of Daviel's treatise, the section could scarcely have included less than $\frac{2}{3}$ of the circumference of the cornea, although plate ii. shows a smaller section. De Wecker replies that in his description Daviel refers only to plate ii., and this only can be regarded as reliable. Besides this, it must be admitted that the plates which appeared seventeen years after Daviel's first communication, and seven years after his

death, might have shown small errors. As regards the section, no definite description can be found, even in the works of Daviel's contemporaries.

From the expression used in regard to the incision with the lance, which was to be carried, "jusqu'au-dessus de la prunelle," while in the figure the point of the lance is a little above the upper pupillary margin, De Wecker concludes that Daviel did not go beyond the height of the pupil when he said that the base of the section should be a little above the pupil. A letter written by Caqué to Daviel in 1752 showed that he was in the habit of excising the iris when it was necessary. Thus, as de Wecker wishes to show, we have now returned to an operative procedure nearly or quite similar to that employed by Daviel.

V. MITTELSTÄDT.

CZERMAK (34) gives in the first portion of his book a good description, with illustrations, of the instruments most used in eye surgery. The subject of asepsis is considered in great detail. The next chapter is on operations and after-treatment, in which he describes the preparation, posture, and costume of the patient, the position of the bed and of the operator and assistants, anæsthesia and dressings.

FERGUS (35) does not give any statistics, but discusses the operation generally under the following headings, viz.: objections to downward section, and to preliminary iridectomy; size and site of section; preparation for, and steps of, operation; congenital and traumatic cataracts; modifications necessitated by complications.

WERNER.

POMEROY (35 *a*) reports 50 extractions without iridectomy, none of which were complete failures. All but four had V above $\frac{20}{200}$. In three cases prolapse of iris occurred from 1 to 3 days after the operation. BURNETT.

ESSEN (36) gives tables of the cataract operations at the New York Eye and Ear Infirmary from October, 1891, to October, 1892. There were thirty-one combined and three with preliminary iridectomy; sixty simple. The healing process was normal in 51, mild iritis in 23, severe iritis in 7, panophthalmitis in 1. In the simple senile cataracts 45 were perfect successes (78.94 %), 2 partial (3.5 %), failures 5 (8.78 %). These operations were divided among sixteen operators. BURNETT.

Out of 1884 patients examined in one year, MITTENDORF (37) found in forty-four a small opacity a little to the nasal side of

the posterior pole of the eye, which he believes corresponds to the place of attachment of the hyaloid artery. Vision does not appear to be affected by them. BURNETT.

BETTMAN'S (38) method of artificial ripening of cataracts is the introduction of a trowel-shaped spatula into the anterior chamber and rubbing the anterior capsule of the lens. In no case has he seen an untoward symptom follow. He claims uniform success with the method. BURNETT.

XVIII.—RETINA AND FUNCTIONAL DISTURBANCES.

39. SCHNABEL. On disturbances of sight in children by suggestion. *Prag. med. Wochenschr.*, 1893, No. 10.

40. WICHERKIEWICZ. On the injurious effect of sunlight on the eye, and in particular the effect of sunstroke on vision. *Internat. klin. Rundschau*, 1893, 1 and 2.

41. MAUTHNER. Amblyopia diabetica. *Ibidem*, 1893, No. 6.

42. ELIASBERG. Ophthalmological contributions. *Centralbl. f. Augenheilk.*, xvii., p. 70. 1. A case of transitory blindness without ophthalmoscopic change, during labor. Complete recovery in two days. 2. A case of blindness from glaucoma at the age of fifteen.

43. GAYET. A case of periodic blindness. *Soc. franç. d'opht.*, 1893, May 1–4.

44. HAHN. A case of progressive failure of sight successfully treated by trephining. *22d Congress German Surgical Society*, Berlin, 1893.

45. SCHÖBL. Cylindro-glioma retinæ. *Centralbl. f. Augenheilk.*, xvii., p. 102.

46. AXENFELD, T. Rupture of the retina in a case with new connective tissue in the vitreous and retina. (Retinitis proliferans.) These ARCHIVES, xxiii., p. 119.

47. HIRSCHBERG. Cure of myopic detachment of the retina after extraction of the opaque lens. Under observation for twelve years. *Centralbl. f. Augenheilk.*, xvii., p. 65.

48. FRIEDENWALD. The interrupted blood column in the vessels of the eye. *Ophth. Review*, xii., p. 161.

49. HOTZ. Blood effusions between the retina and vitreous body. *Annals of Oph. and Otol.*, Jan., 1893.

50. BULL, C. S. Contribution to the subject of intracranial lesions, with defects in the visual fields. Five cases with autopsies. *Trans. Amer. Ophth. Soc.*, 1892.

51. MARPLE. The occurrence and significance of unilateral albuminuric retinitis. *Med. Rec.*, March 11, 1893.

52. KOLLOCK, C. W. Cases of monocular amblyopia in the same family. *Trans. Amer. Ophth. Soc.*, 1892.

53. PARK, J. WALTER. Reflex amblyopia. *Annals of Ophth. and Otol.*, Jan., 1893.

54. SUTPHEN, T. Y. Result of scleral puncture in two cases of detachment of the retina, the first successful in restoring useful vision, the second resulting in slight improvement only. *Trans. Amer. Ophth. Soc.*, 1892.

SCHNABEL (39) in the opinion of the reviewer describes and attempts to explain on the theory of auto-suggestion the cases which for a long time have been known and described as retinal anæsthesia (Graefe) or hyperæsthesia (Steffan), with or without concentric contraction of the visual field, spasm of accommodation, etc. The chief symptom is that without glasses they appear amblyopic, while with negative or plain glasses they see well.

H. KNAPP.

GAYET (43) reports the case of a boy, aged seventeen, well developed mentally and physically, who in October and December, 1892, and in January and February, 1893, had attacks of absolute amaurosis without ophthalmoscopic change. The attacks lasted from twenty-four hours to five days. The pupillary reaction was normal during the attacks. There were no prodromes. Visual field and color-sense were normal between the attacks. No heredity. One brother died in infancy of meningitis, and the patient had a similar disease in his third year, which was completely recovered from. Four months before the first attack of blindness he lost consciousness for a short time, and afterwards had attacks of dizziness. Since the patient showed no signs of hysteria, Gayet concluded that it was a case of sensitivo-sensorial epilepsy. Parisotti observed similar symptoms in a case with psychic degeneration. Grandclément called attention to the transitory attacks of amaurosis in neurasthenics.

SULZER.

HAHN'S (44) patient was a butcher addicted to alcohol, with various cerebral symptoms. The vision was completely lost in

the left eye and began to fail in the right. There was marked papillitis, right. A diagnosis was made of cysticercus in the left frontal lobe. The forehead on the left side where the pain first began was more sensitive to pressure than on the right. Hahn made a temporary resection of the skull according to Wagner's method. No tumor was found. 100 gr. of fluid were evacuated from the ventricle. The course was favorable, the weakness of memory disappeared, the vision improved. Two years later the patient was still able to follow his occupation, so the result may be considered permanent.

SCHÖBL (45) in a greatly thickened retina found a very marked development of new blood-vessels, whose walls showed hyaline degeneration, and which were each surrounded with a sheath of glioma cells.

FRIEDENWALD (48) cites cases of embolism and glaucoma in which he had observed the blood-current in the retina interrupted in parts; he also observed it in excised pig's eyes, and in the newly formed corneal vessels in vascular keratitis, as well as in the fine conjunctival vessels. In microscopic examination of pig's eyes, he found that the red corpuscles collected together to form the red streaks, and that the white portions were occupied by blood-plasma containing white corpuscles. WERNER.

In the three cases seen by HOTZ (49), the circular, clearly circumscribed blood-effusion at the macular region he regarded as being between the retina and vitreous. All the cases recovered with good vision. The causes are obscure.

BURNETT.

BULL (50) gives the history in detail of five cases of intracranial lesion of various kinds, which were associated with defects in the visual field during life, together with an account of the lesions found on autopsy. These cases are: I. Pachymeningitis of the convexity of the brain, extensive endarteritis at the base. II. Sarcoma of the optic chiasm and nerves. III. Sarcoma of the left occipital lobe of the brain. IV. Thrombosis of the middle cerebral artery; recent clot in the middle cerebral lobes. Sarcoma of the right optic tract. V. Gliosarcoma of the cerebellum. BURNETT.

MARPLE (51) arrives at the conclusion, from a study of his own cases and those recorded by others, that a unilateral appearance of retinitis in Bright's disease is of rare occurrence, and where such cases do occur it is most probable that nervous influences

of some sort (probably ganglionic changes) are in operation conjointly with the other causes. BURNETT.

KOLLOCK (52) found in four members of the same family—two brothers and two sisters—an amblyopia in the left eyes. In one there was a marked atrophy of the nerve, in one a choroiditis, in one what was probably the remains of a hyaloid artery ; in the other nothing that could account for the condition. All were hyperopic more or less. There was probably inherited syphilis as a cause. BURNETT.

PARK (53) has seen three cases of diminished visual acuteness, with narrowing of the visual fields caused by dental irritation of the fifth pair. On the removal of this, the trouble disappeared. BURNETT.

In SUTPHEN'S (54) first case, the detachment probably followed an injury, since the fellow eye had been lost by an explosion of powder, and there was a dark spot on the sclera corresponding to the detachment in the eye that remained. The media were clear. Pilocarpine injections and rest were first tried, but no improvement was obtained. Scleral puncture was then made and useful vision was restored. In the other case, scleral puncture was not so efficacious, probably because there was an associated choroiditis. BURNETT.

XIX.—OPTIC NERVE.

55. MÜLLER. Atrophy of the optic nerves in three brothers. *Zehender's klin. Monatsbl.*, xxxi., Jan.

56. BAQUIS. On primary optic neuritis. *Ann. di Ottalm.*, xxii., 1, p. 3.

57. GUÉPIN. Cerebral syphiloma ; double optic neuritis. General considerations on optic neuritis and atrophy. *Rev. génér. d'opht.*, April, 1893.

58. HASSLER. A pistol-shot through the floor of the mouth, tongue, palatine arch, and left optic nerve. *Lyon méd.*, Feb., 1893.

59. SCHANZ. On the simultaneous occurrence of optic neuritis and acute myelitis. *Deutsche med. Wochenschr.*, 1893, No. 26.

60. PERETTI. A case of descending atrophy of the optic nerve after injury of the skull. *Ibidem*, 1893, No. 13. (White optic disc fifteen days after the attack.)

61. MÜLLER. Retrobulbar neuritis with exophthalmus. *Zehender's klin. Monatsbl.*, xxxi., Jan.

62. DE SCHWEINITZ. Hyaline bodies (Drusen) in the nerve head. *Trans. Amer. Oph. Soc.*, 1892.

BAQUIS (56) saw a marked unilateral optic neuritis in a healthy girl of twenty, for which no cause could be found, and which was therefore called a "primary inflammation of the optic nerve." Besides a slight cloudiness of vision there were no subjective symptoms, and the acuteness of vision and the visual field were normal. After two months' treatment with iodide of potassium the cloudiness disappeared and the disc regained its normal appearance. Five months later the condition was still good.

DANTONE.

In accord with Chaslin, Achard, Gley, and A. Marie, GUÉPIN ascribes optic-nerve atrophy to two anatomical processes, viz., sclerosis of the connective tissue and sclerosis of the neuroglia. Both processes are always found together, but the predominance of one or the other determines the variety of the atrophy. Sclerosis of the neuroglia causes gray atrophy, and connective-tissue sclerosis, nephritic and white atrophy. SULZER.

SCHANZ'S (59) case, in a patient aged nineteen, resembled those reported in the literature. The ocular affection precedes the spinal, and is a retro-bulbar neuritis which descending to the disc causes marked disturbance of vision, but usually ends in recovery. In this case inunction treatment was followed by recovery.

DE SCHWEINITZ'S (62) case is interesting from the fact that his examination of the hyaline bodies on the nerve head showed them to be distinct from the excrescences on the lamina vitrea of the choroid. The atrophy of the optic nerve which existed in his case and the degeneration of the vascular walls which attended it were shown to have no connection with the bodies on the disc. Fine photo-micrographs illustrate the paper. BURNETT.

XX.—INJURIES, FOREIGN BODIES (PARASITES).

63. SCHÖBL. Cysticercus subretinalis triplex. *Centralbl. f. Augenhk.*, xvii., p. 101.

64. THEOBALD. Removal of a fragment of steel from the vitreous chamber, by means of the electro-magnet, with preservation of nearly normal vision. *Trans. Amer. Opth. Soc.*, 1892.

65. BULLER. A foreign body in the retina. *Trans. Amer. Oph. Soc.*, 1892.

66. HUBBELL. Extraction of steel from interior of the eye with the electro-magnet. *The Oph. Record*, Feb., 1893.

67. COCKS, GEO. H. Glass lodged in the iris for seventeen months without inflammatory symptoms, and vision $\frac{14}{15}$. *New York Eye and Ear Infirmary Reports*, No. 1.

68. OLIVER. History of a case of gunpowder injuries to both corneæ, irides, and lenses, with subsequent restoration of vision to almost full acuity. *Trans. Amer. Ophth. Soc.*, 1892.

69. MARBOURG. Extraction of steel from the eye with the electro-magnet. *The Ophth. Record*, April, 1893.

SCHÖBL (63) saw in a boy aged five three distinct elevations of the retina, elliptical in form, giving a yellowish-white reflex, and filling the greater part of the vitreous chamber. At times a membranous formation could be made out behind the wall. The diagnosis of multiple cysticercus was made by Schöbl, but the eye was enucleated because another oculist made a diagnosisof glioma. The examination of the eyeball confirmed Schöbl's diagnosis.

The peculiarity of THEOBALD'S case is that the removal of the steel was not made until eleven days after the receipt of the injury. Five introductions of the point of the magnet were made before the foreign body became attached. Vision was nearly normal four months after the removal. BURNETT.

In BULLER'S (65) case a bit of steel was lodged in the back of the eye, three disc-diameters below the disc where it could be distinctly seen with the ophthalmoscope. The vitreous, barring some shreds of blood, was clear. Papillitis and retinitis set in but passed off, and the eye is now quiet with V = $\frac{6}{9}$. The choroid around the foreign body is atrophic. BURNETT.

HUBBELL (66) gives the histories of 10 cases, in which he has extracted pieces of steel from the vitreous, by means of the electro-magnet. In 8 cases the body seemed to be resting in the vitreous, in 1 it was embedded in the retina, in 1 attached to the ciliary body. The largest piece weighed 7 grains. One eye was lost by infection in spite of antiseptic precautions. In 7 cases the body was extracted through the original wound at the first attempt. BURNETT.

In the case reported by COCKS (67), a piece of glass entered the eye through the cornea, from the explosion of a gas meter.

Inflammation and a slight opacity of the lens followed, and on its subsidence a piece of glass was seen sticking in the iris. It became dislodged by a blow, and fell into the anterior chamber, from which several unsuccessful attempts at removal were made. All irritation finally disappeared, leaving V = $\frac{1}{15}$.

BURNETT.

In OLIVER's (68) case there was injury to the corneæ, lenses, and irides, from an explosion of gunpowder in the face. The grains of powder were carefully picked from the corneæ and conjunctivæ, and the eyes treated with atropine and cold compresses. In one, a swelling of the lens caused glaucomatous symptoms, which necessitated an iridectomy and an evacuation of the lens. With correction, V = $\frac{5}{10}$ in both as a final result.

BURNETT.

In MARBOURG's (69) case the piece of steel entered the cornea near the scleral margin and across the anterior chamber into the vitreous, the lens being pushed aside. The magnet was introduced in one hour and a half after the accident and the steel brought away at once. The prolapsed iris was returned, and the patient had a round pupil and V = $\frac{8}{10}$. BURNETT.

XXI.—OCULAR DISTURBANCES WITH GENERAL AFFECTIONS.

70. THOMAS. Ophthalmic migraine, associated with hysteria in infants. *Rev. méd. de la Suisse romande*, Dec. 20, 1892.

71. BACH. Exophthalmus, abnormal pupillary reaction, and muscular disturbances with lead intoxication. *Arch. f. Augenheilk.*, xxvi., p. 219.

72. SCHMIDT-RIMPLER. Bilateral hemianopsia with autopsy. These ARCHIVES, xxii., p. 313.

73. KOLISCH. A case of tumor of the pons. *Wiener klin. Wochenschrift.*, 1893, No. 14.

74. BLEULER. A case of aphasic symptoms, hemianopsia, amnesic color-blindness, and mental paralysis. *Arch. f. Psych. und Nervenkrankh.*, xxv., 1, p. 32.

75. UHTHOFF. Investigations on the ocular disturbances occurring with syphilis of the central nervous system. *Graefe's Archiv*, xxxix., 1, p. 1.

76. Cerebral syphilis and paralysis of the right abducens nerve. *Boll. d'Ocul.*, xv., 10.

77. GRENOUVILLE, with a notice by Panas. Fracture of the base of the skull, with paralysis of the external rectus. Autopsy. *Arch. d'opht.*, xiii., 2, p. 65.

78. SMITH, PRIESTLEY. Toxic amblyopia from iodoform. *Ophth. Review*, xii., p. 101.

79. FRIEDENWALD, H. Cranial deformity and optic-nerve atrophy. *Amer. Jour. Med. Sc.*, May, 1893.

80. PATTERSON. Reflex ocular disturbances from irritation of the genital organs. *Annals of Ophth. and Otol.*, April, 1893.

81. BROWN, E. J. Optic atrophy consecutive to mammary carcinoma and influenza. *Ophth. Record*, May, 1893.

82. POLLAK, S. Ophthalmia albuminurica. *Amer. Journ. of Ophth.*, May, 1893.

83. KIPP. A case of bilateral recurrent inflammation of Tenon's capsule in connection with profound mercurial poisoning. *Trans. Amer. Ophth. Soc.*, 1892.

84. GIFFORD. Hemianopsia as a sequel of *la grippe*. *Ophth. Record*, May, 1893.

85. HANSELL. The possibility of the early diagnosis of locomotor ataxia by eye symptoms. *Jour. Amer. Med. Assoc.*, Feb. 18, 1893.

86. GOLDZIEHER. A case of tuberculous tumor in the corpora quadrigemina with bilateral ophthalmoplegia. *Centralbl. f. Augenheilk.*, xvii., p. 44.

SCHMIDT-RIMPLER's (72) patient, aged fifty-one, developed a hemianopsia after paresis of the right extremities and headache. A year later she became suddenly blind. Gradually a very small central field of vision was restored. The autopsy showed as the cause of the right hemianopsia a dural hæmatoma, and as the case of the left hemianopsia several foci of softening in the posterior portion of the right occipital lobe. He gives a résumé of the cases previously reported, and adheres to the view that the macula is supplied by both tracts and that the portion of the cortex corresponding to the macula is particularly resistant to pathological processes.

In BLEULER's (74) case there was softening of the left island of Reil, the greater portion of both central convolutions, the underlying medullary substance, and some neighboring parts.

Of the 100 cases of syphilis of the central nervous system

examined by UHTHOFF (75) an autopsy was obtained in 17. The conditions most frequently found were gummous basal meningitis, and Heubner's specific affection of the cerebral arteries. In other cases there were gummous tumor and gummous meningitis of the convexity; syphilis of the cord and isolated gummous degeneration of individual cerebral nerves. The infection was from four to ten years earlier. Anatomical changes in the eyeballs were found in 2 cases, changes in the optic conducting apparatus 14 times (choked disc, neuritis, atrophy). The intracranial portion showed neuritis and perineuritis, but more frequently true gummous changes, at times with great increase in the size of the nerve. These had their origin, in most cases, in the chiasm. In one case there was a primary gummous affection of one tract. In contrast with the frequent affection of the cerebral arteries, is the rare involvement of the ophthalmic artery and its branches. It was not the arterial changes of the cerebral arteries but the gummous affection that caused the disturbances of vision. The results of the autopsy in his 17 cases are compared with 150 cases collected from the literature. In 10 cases there was simple atrophy of the optic nerve, with no trace of previous inflammation, it being a secondary descending atrophy. The oculomotor nerve was affected 10 times, 6 bilaterally and 4 unilaterally. Almost always the interpeduncular space was the seat of the lesion, a basilar meningitis causing atrophy of the nerves by compression. The nerves themselves were only affected later and then in the form of a gummous neuritis. The functional disturbances did not always correspond to the anatomical conditions found. Unilateral paralysis of the oculomotor and paralysis of the opposite side of the body were due to foci in the region of the peduncle and pons. The abducens was affected 3 times; with unilateral paralysis and paralysis of the opposite half of the body, the lesion as a rule was in the pons. Paralysis of the fourth nerve was very rare. The ocular muscles showed in 3 cases a proliferation of the interstitial tissue and degeneration of some muscle bundles. Affection of the trigeminus was found 3 times. The 167 autopsies showed involvement of the optical apparatus 101 times, of the oculomotor 66, the abducens 29, the trochlearis 6, and the trigeminus 25 times.

The case reported anonymously in the *Boll. d'Ocul.* (76) was one of abducens paralysis with contraction of the visual field and

diminution of vision without ophthalmoscopic change. The diagnosis was made of a syphilitic neoplasm in the brain, since the severe pain in the head and the diplopia, which resisted many forms of treatment for months, yielded in a short time to the energetic employment of mercury and iodide of potassium.

GRENOUVILLE (77) observed in a man aged forty-seven a fracture of the base of the skull by a glancing shot in the region of the right coronary suture without injury to the bone at this point. The fracture, beginning at the right side of the forehead, passing on each side of the cribriform plate of the ethmoid, extending on the right side toward the optic foramen, and on the left toward the sphenoidal fissure, then through the sphenoid and the base of the petrous bone, and ending in the region of the tympanum. Besides loss of consciousness and a serous discharge from the nose, there was a left abducens paralysis, which disappeared at times. No paralysis of the extremities. At the autopsy the left abducens was found to be normal in its entire course, except where it crossed the petrous bone, and here there was a small hemorrhage, which explained the paralysis. Panas, to whom the preparation was shown, called attention to his paper published in the *Arch. a'opht.* in 1880 on the importance of this symptom in the diagnosis of the fracture of the petrous bone.

V. MITTELSTÄDT.

P. SMITH (78) refers to cases recorded by Hirschberg and G. Hutchinson. The patient in this case (aged thirty-one) suffered from chronic tubercular peritonitis and pleurisy. He was taking iodoform pills for forty-one days, increasing up to thirty-two grains per diem. The toxic symptoms consisted in headache, giddiness, drowsiness, depression, slight left ptosis, numbness and tingling in the legs; impaired vision, with small central color scotoma; slight haziness of disc margins. The patient had ceased smoking seven weeks before. WERNER.

FRIEDENWALD (79) reports a case of oxycephalia in which vision was $\frac{8}{12}$ in right and $\frac{8}{18}$ in left, with atrophy of papillæ. This defect in vision has existed at least since early childhood. There is a restriction in each eye on the nasal side. BURNETT.

PATTERSON (80) gives the histories of several cases of photophobia, lachrymation and corneal ulceration, in which irritation of the genitals, mostly masturbation, was found, and when this irritation was suspended relief was obtained. Usually all other means had been tried and failed. BURNETT.

BROWN (81) reports the case of a woman who was suffering from carcinoma of the breast, and in whom a neuritis, followed by atrophy, developed in the right eye some two months after an attack of influenza. BURNETT.

In POLLAK's (82) very peculiar case, a girl of seven years, after exposure to severe cold affecting her feet, was seized with a sudden blindness, preceded by red vision. The eyes when examined seemed perfectly white; the anterior chamber was completely filled with a cotton-white substance, entirely concealing the iris. There was no pain, but total blindness. There was at the same time a profuse mucorhœa from the fauces, and the urine was highly albuminous. At the end of ten days the anterior chamber cleared up, showing the iris with a pupil dilated freely with atropine. The fundus was not visible, the vitreous chamber being filled apparently with the same white substance that had filled the anterior chamber. About a month afterward signs of panophthalmitis showed themselves in both eyes, but more pronounced in the right, and this latter was enucleated. The other ball was saved, but with a cataractous lens and an adherent and distorted pupil.

Dr. Alt made an examination of the enucleated ball, and found the changes and characteristic appearances of croupous or spongy irido-choroiditis. This peculiar form of inflammation seemed to have affected the whole of the uveal tract.

BURNETT.

KIPP'S (83) case is remarkable from the fact that there were in all six attacks of inflammation of Tenon's capsule successively in the two eyes, having, however, no serious results as to vision. The first attack followed an injury which was regarded as slight, but the man was suffering under profound mercurial poisoning.

BURNETT.

In the case of a man reported by GIFFORD (84) at the close of an attack of *la grippe*, there was a right-sided hemianopsia associated with severe pain in the back of the head. The line of demarcation followed the vertical meridian pretty closely. In addition, the right half of the field of the left eye was gone, while in the field of the right eye there is a small area at the lower outer corner where there is still p. l. Two years after, the conditions were essentially the same. BURNETT.

From a study of the symptoms of ataxia, HANSELL (85) concludes that a transient external paralysis not otherwise accounted

for may be an indication of tabes, that the Argyll-Robertson pupil is very suspicious, and that idiopathic optic-nerve atrophy often precedes by months or years the manifestations of sclerosis elsewhere. BURNETT.

GOLDZIEHER (86), from an autopsy on a patient aged five, concludes: 1. That a tumor involving the entire region of the corpora quadrigemina need not cause blindness; 2. A typical ophthalmoplegia externa coming on with drowsiness need not be due to primary nuclear changes; 3. Ophthalmoplegia combined with staggering and disturbances of co-ordination in the lower extremities, allows us to diagnose the seat of the disease as the corpora quadrigemina.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE THIRD QUARTER OF THE YEAR 1893.

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WITH THE CO-OPERATION OF

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Translated by Dr. WARD A. HOLDEN.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

TEXT-BOOKS, MONOGRAPHS, AND TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS. STATISTICAL REPORTS.

87. GÜNSBERG. Ophthalmic observations. *Wjestnik Ophth.*, 1893, Nos. 4–5.

88. RAUCHBERG. The Austrian census of 1890 in relation to the infirm and mentally deficient. *Beilage zu No. 26 des österr. Sanitätswesens*, 1893.

89. Thirty-fourth annual report of the charitable institution for eye patients in Utrecht, 1893.

90. Statistics of blindness in England and Wales. *Brit. Med. Journ.*, Oct., 1893, p. 804.

91. MACHEK. The eye department of the Lumberg hospital. Report for 1892.

92. SILEX. Compendium of ophthalmology. For students and physicians. 2d edition, Berlin, 1893.

Among the cases GÜNSBERG (87) describes the following: 1. Cyst of the iris, after perforating injury of the cornea with prolapse of the iris, terminating in chronic iridocyclitis with atrophy of the ball. The cyst developed from the portion of the iris between the anterior synechia and the ciliary body. 2. Coloboma of the iris and choroid, with normal field of vision and normally functionating retina over the coloboma. 3. Congenital cyst of the lower lid with microphthalmus. A portion of the anterior wall of the cyst was removed, and microscopic examination led him to the conclusion that the wall of the cyst represented the rudiment of the anterior layer of the primary optic vesicle, the retinal layers being in reversed order, agreeing with Czermak's explanation. HIRSCHMANN.

According to RAUCHBERG (88) the census of 1890 showed that there were 19,264 blind persons in Austria, the ratio being as 8.1 to 10,000 inhabitants. Only 7.5 per cent. of these were cared for in special institutions. HERRNHEISER.

In Utrecht (89) in the year 1893, 3802 out-patients were treated, 444 admitted to the hospital, and 348 operations, including 50 extractions, were done. WESTHOFF.

In 1871 in England and Wales (90) there were 951 blind to each 1,000,000 inhabitants; in 1881, 879; and in 1891, only 809. WERNER.

The second edition of SILEX's (92) compendium is considerably enlarged and improved. The number of illustrations is greater, and new chapters have been added.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPY.

93. CHIBRET. On ocular syphilis and its treatment. *Ann. d'Ocul.*, CX., p. 8.

94. KATZ. On skiascopy. *Wratsch*, 1893, No. 15.

95. MARTHEN. Experimental investigations on antisepsis in eye operations, and the bacteriology of the conjunctival sac. *Beiträge zur Augenh.*, 1893, No. 12.

96. VELHAGEN. On the galvanic excitation of the diseased eye. *Arch. f. Augenh.*, xxvii., p. 62.-

For ten years CHIBRET (93) has used subcutaneous injections of cyanide of mercury in the treatment of syphilis. He has arranged the results of different methods of treatment in tabular form, and comes to the following conclusions: Injections of cyanide of mercury act fifteen times more quickly than inunctions. The simultaneous use of iodide of potassium delays the action of the mercury. SULZER.

KATZ (94) recommends skiascopy in the examination of schools bodies of recruits, etc., because its simplicity permits its employment by persons not trained in ophthalmology. He uses a plane mirror with a perforation of 1.5 *mm*, having an arrangement by which the lenses + 3, + 6, + 9, − 3, − 6, and − 9 can be brought before the perforation. HIRSCHMANN.

III.—INSTRUMENTS AND REMEDIES.

97. VALUDE. A new antiseptic. Formaldehyd. *Ann. d'Ocul.*, cx., p. 19.

98. GAGARIN. On subconjunctival injections of sublimate. Dissertation, St. Petersburg, 1893, p. 72.

99. PENNOW. Subjunctival injections of sublimate in ophthalmology. *Wjest. Ophth.*, 1893, No. 4–5.

100. BELLARMINOW. The action of scopolamin on the eye. *Wratsch*, 1893, No. 17.

101. ILLIG. On the action of scopolaminum hydrobromicum. *Münch. med. Wochenschr.*, 1893, No. 33, p. 617.

102. TERSON. Blepharostat. *Arch. d'opht.*, xiii., p. 555.

103. MAKLAKOFF. Edison's electric style in ophthalmology. *Ibid.*, p. 530.

104. PONSIER. Electricity in ocular therapeutics. *Nouveau Montpellier médical*, Jan., 1893.

105. BAGOT. New pocket perimeter. *Ann. d'Ocul.*, cx., p. 100.

106. ROTH. On a new stenopaic glass. *Arch. f. Augenheilk.*, xxvii., p. 110.

107. JACKSON. The rod test with the rotatory variable prism. *Ophth. Review*, xii., p. 228.

108. ZIEGLER. A convenient prism scale. *Ann. of Ophth. and Otol.*, July, 1893.

109. ALT. On tropa-cocaine the local anæsthetic. *Amer. Journ. of Ophth.*, Jan., 1893.

Formaldehyd (97) [CH_2O] is obtained by vaporizing methyl alcohol over glowing coals. It is a colorless fluid, readily soluble in water. Its odor is like that of formic acid. It does not coagulate albumen, and its toxic action is slight, while its sterilizing power is very great. One fourth of a grain of formaldehyd to the quart is sufficient to prevent the development of pathogenic micro-organisms in bouillon, while three fourths of a grain of bichloride of mercury is required in order to produce the same effect. VALUDE has used formaldehyd for sterilizing the conjunctival sac. After cleansing the two eyes, one was sterilized with 2 % formaldehyd solution and bandaged, the other was similarly treated with a strong sublimate solution. The following day cultivations were made from each conjunctival sac. The eyes in which formaldehyd had been used gave fourteen sterile tubes and two infected ones, while the eyes in which sublimate had been used gave cultures in one half the tubes. In a case of infection after cataract extraction, all inflammatory signs disappeared in forty-eight hours under the influence of repeated instillations of 1 % formaldehyde solution. A ½ % solution acted well in cases of purulent conjunctivitis and purulent lachrymal affections. It produces but little irritation. A 2 % solution does not affect instruments more than alcohol does. SULZER.

GAGARIN (98) used repeated injections of sublimate in many cases of iritis gummosa, plastic iritis with various complications, irido-choroiditis after recurrent fever, different forms of irido-cyclitis and irido-choroiditis, parenchymatous keratitis, corneal ulcer with hypopyon, different injuries with their consequences, episcleritis, absolute glaucoma, disseminate chorio-retinitis, optic neuritis, and trachomatous pannus. He obtained good and rapid results in hypopyon keratitis, irido-cyclitis, and irido-choroiditis, the hypopyon disappearing. The continuation of the injections did not cause much further improvement. In the various forms of iritis the result was also good. In parenchymatous keratitis and episcleritis no improvement was obtained. In one of two cases of pannus there was a considerable clearing up of the cornea in a short time. The proper dose is a quantity occupying two or three divisions of a Pravaz syringe of 1:1000 solution. Stronger

solutions cause local symptoms of irritation. It was rarely necessary to make more than three or four injections, and often one or two were sufficient. The effect on pain was very marked when 3 % of cocaine nitrate was added to the sublimate solution. The necessary general treatment and the local use of mydriatics should not be neglected. HIRSCHMANN.

PENNOW (99) in 140 cases of different eye disease used subconjunctival injections of sublimate (1-3000 and 1-2000, 1–4 divisions of a Pravaz syringe every 3–6 days). The pain produced was not marked. The consequent swelling of the conjunctiva lasted 2–7 days. The effect was particularly good in beginning purulent iritis and irido-cyclitis after cataract extraction; in traumatic cyclitis with beginning sympathetic ophthalmia (the injections were made in both eyes; both were cured, and enucleation was not necessary); in choroiditis, chorio-retinitis, and neuro-retinitis, particularly when syphilis was the cause; and in one obstinate case of diffuse opacity of the vitreous. In hypopyon keratitis, parenchymatous keratitis, and in a case of embolism of the central artery of the retina, considerable improvement was obtained. In atrophy of the optic nerve (three cases) the effect was doubtful. In most of the cases the indicated general treatment was not neglected. HIRSCHMANN.

Experiments on healthy and diseased eyes gave BELLARMINOW (100) the following results. Scopolamin instilled into the eye produces its mydriatic effect more quickly than atropine, but it is of shorter duration. The mydriasis begins with a peculiar egg-shaped dilatation of the pupil. If cocaine is used simultaneously the mydriatic action is intensified. Scopolamin does not influence the intraocular tension. It would seem to be capable, like atropine, of bringing on attacks of glaucoma. It is more readily diffusible than atropine. In all conditions in which the use of atropine is indicated scopolamin is well borne and acts more energetically. Strong solutions cause general symptoms more quickly than atropine, but when weak solutions are used, these do not occur. HIRSCHMANN.

In order to avoid the danger of infection from the contact of instruments with the lashes and margins of the lids, TERSON (102) has devised a speculum having two grooved processes which cover the lid margins. The speculum is fixed by a screw which only prevents the branches from being separated farther, and permits the ready removal of the instrument from the eye.

v. MITTELSTÄDT.

Edison's electric style which MAKLAKOFF (103) used in his therapeutic investigations, is a small electrometer which moves a needle up and down, so that in a few seconds a great number of punctures of equal depth may be made. This needle has been used for tattooing, and is commended for the rapidity and exactness with which the operation may be performed. Its broadest application is in its employment for purposes of massage, an ivory ball then being substituted for the needle. In tetanizing the eye, as Maklakoff terms his procedure, the ivory ball is passed about the cornea in the ciliary region for a minute or two, no signs of irritation being produced. When the eye is sensitive a gutta-percha bag filled with water is placed upon the lids and this struck with a pleximeter. The effect of this procedure in various affections of the eye is astonishing. In the normal eye there is caused a marked contraction of the pupil, injection of the minor circle of the iris, venous pulsation of the disc, and a considerable diminution of tension; the latter is also noticeable in cases of glaucoma, although at first there is often an increase in tension. In cases of hypotony the tension is increased. In traumatic cataract the breaking down and resorption of the opaque masses are hastened. The procedure is useful in many affections of the cornea and iris, but the observations are still too few to be reliable.

V. MITTELSTÄDT.

ZIEGLER'S (108) prism scales is formed on those by Prentice and Maddox, and consists of two scales at right angles—whose division gives a deviation of two degrees or prism dioptries at two metres. The scale is useful not only for determining the power of prisms, but also indirectly of spherical or cylindrical lenses, and is a convenient instrument for determining the centration of lenses.

BURNETT.

ALT'S (109) experience with tropa-cocaine has not convinced him of its superiority over cocaine as an anæsthetic. Its action is rapid, but it is also very evanescent, lasting only about six minutes. It does not produce the hypotony that cocaine does.

BURNETT.

IV.—ANATOMY.

110. VIALET. On the existence in the inferior portion of the occipital lobe of a transverse association fascicle. *Soc. de biol.*, July, 1893, and *Ann. d'Ocul.*, CX., p. 206.

111. PESCHEL. On the orbital nervous apparatus of the rab-

bit with special reference to the ciliary nerves. *Graefe's Archiv*, xxxix., 2, p. 1.

In vertical transverse sections through the occipital lobe VIALET (110) has found an undescribed association bundle arising in the white substance of the lingual lobule, in front of the inferior branch of the calcarine fissure, and spreading out in the white substance of the second and third occipital convolutions. He calls it the transverse bundle of the lingual lobule. It probably connects the visual perception centre of the occipital lobe with the visual memory centre of the convexity. SULZER.

PESCHEL (111) found a very complicated arrangement of the nerves in the orbit of the rabbit. Altogether he discovered eighty-five ganglia that could be isolated. He made his preparations with very fine needles under a magnifying power of 60–80 diameters. The results of his dissections are shown in three plates. He made numerous measurements of the thickness of single nerve branches and twigs.

He was able to show that sympathetic fibres run in the long ciliary nerves. The ciliary ganglion belongs to the oculo-motor nerve, and is analogous to the spinal ganglia. Near the ganglia belonging to the oculo-motor nerve were undoubted sympathetic ganglion cells. The extirpation of the ciliary ganglion in nine cases showed the author that this ganglion possesses no special function in respect to the secretion of the intraocular fluids. The effect is the same as that following destruction of the oculo-motor fibres passing through the ganglion.

V.—PHYSIOLOGY.

112. LJACHOWITSCH. On the accuracy of the present tonometric methods, and their practical application. An experimental clinical study. Dissertation, St. Petersburg, 1893.

113. GUILLOZ. Instantaneous photography of the fundus. *Arch. d'opht.*, xii., 8, p. 465.

114. SCHAPRINGER. On the theory of the fluttering hearts. *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, v., H. vi., p. 385.

115. BULL, OLE. On perimetry with colored pigments. *Annal. d'Ocul.*, cx., p. 169.

Experiments on eighty-four eyes of men and animals led

LJACHOWITSCH (112) to the following conclusions: 1. The tonometers of Maklakow and Fick give different results on eyes having equal intracular tension in different animals, or in animals of different ages. 2. The sensibility of Maklakow's tonometer decreases as the intraocular tension becomes increased; while the decrease in sensibility is less marked in Fick's tonometer. 3. Both tonometers are more sensitive than the palpation method. 4. The average normal intraocular tension is 26 *mm* Hg. varying not more than 3 or 4 *mm* Hg. in either direction. 5. In the various forms of glaucoma the tension varies between 32 and 100 *mm* Hg., most frequently being between 50 and 70. 6. The results obtained by the Maklakow instrument do not vary in accuracy more than 0.2 to 0.3 *mm* Hg. 7. The accuracy of the results obtained by Fick's instrument is on an average 2.6 *mm* on the cornea and 3.4 *mm* Hg. on the sclera. The utility of Fick's instrument would be increased by making some technical improvements and by placing it on the cornea.

HIRSCHMANN.

BULL (115) accepts the modifications of Hering but protests against Hering's claim to have first recognized the difference between value in terms of white, and color intensity. The affections of the color-sense in eye diseases may be divided into three classes.

1. Equal diminution of color perception for the four fundamental colors.

2. Diminished perception for red and green, but not for blue and yellow.

3. The tints of green are confused with blue and those of yellow with red; red and yellow also appear darker than blue and green.

The first category is found with optic-nerve diseases dependent upon diminished power of conduction or upon circulatory disturbances in the retina. The second is found with certain atrophies, such as those following tabes and the abuse of tobacco. The third is characteristic of all affections showing diminution of the light sense, such as chorio-retinitis syphilitica, retinitis pigmentosa, etc. Hering's theory explains more phenomena than Young's, but not all. Unfortunately it prejudices the judgment of the investigator. Thus Hegg holding to the theory draws the conclusion, contrary to the facts observed, that the fields for yellow and blue are equal. SULZER.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

116. SILEX. Report on the eyes of the children in the orphan asylum and reformatory in Rummelsburg, Berlin, 1893.

117. SEGGEL. Second report of the Munich Commission for investigating the influence of vertical and oblique handwriting. *Munich med. Wochenschr.*, No. 13, *et seq.*

118. BIEGEL. The normal refraction of new-born infants. *Weekblad van hed Nederlandsch Tydschrift voor Geneeskunde*, part ii., p. 441, 1893.

119. THIER. The operative correction of myopia of high degree by discission of the lens. *Deutsche med. Wochenschr.*, 1893, No. 30.

120. GELLZUHN. On a case of hyperopia of high degree, with special reference to diagnosis. Inaug. Dissert., Berlin, 1893.

121. SAVAGE, E. C. The relations of the centres of accommodation and convergence. *Ophth. Record*, No. 5, 1893.

122. FISCHER, K. On the relation of accommodation and convergence of the visual lines. Inaug. Dissert., Halle, 1893.

123. MINNEY. Should a mydriatic be used as a rule in refraction cases? What one? *Kansas Med. Jour.*, July, 1893.

124. JACKSON, E. The crossed cylinder. *Ophth. Record*, June, 1893.

125. LAUTERBACH. The value of the ophthalmometer in the determination of the axis and amount of astigmatism. *N. Y. Med. Jour.*, Aug. 5, 1893.

Among 950 eyes in the orphan asylum, SILEX (116) found 61.8 % emmetropic, 17.75 % hyperopic, 8.2 % myopic, and 12.25 % astigmatic. In 16 % the acuteness of vision was less than one half. Among the latter 15.9 % were myopic, 43.1 % astigmatic, and 41 % hyperopic or emmetropic, with corneal opacities, or with lack of pigment in the fundus.

SEGGEL (117), in the schools where the vertical handwriting was used, found 4.8 % myopic; in those where the oblique handwriting was practised, 5.8 %.

BIEGEL (118) examined 42 new-born infants by means of sciascopy, after the instillation of a 1 % solution of homatropin. In 39 cases there was hyperopia ranging from 1 to 5 dioptries, in none emmetropia, in one myopia, in one astigmatism, and in one

he was unable to determine the refraction. The normal refraction in the new-born is therefore hyperopia up to 3 dioptries.

WESTHOFF.

THIER (119) discinded the lens in 9 cases of high myopia, between the ages of nine and forty-two years. The results were all good, and in some the acuteness of vision was much increased.

GELLZUHN (120) in an orphan boy of seven found hyperopia of over 20 D in each eye. After correction the vision was $\frac{1}{20}$.

The practical purpose of SAVAGE'S (121) paper was to show how in cases of heterophoria, with refractive errors, it is necessary to modify the correction of the ametropia according to the condition of the muscles. For example, hyperopia should be corrected in full when associated with esophoria, and but partially when associated with exophoria, and the contrary in myopia.

BURNETT.

MINNEY (123) has obtained the practical views of 22 of the leading oculists in the United States as to the employment of a mydriatic in testing for refraction, and among these five use it in every case, two in 90 % of their cases, three in 25 % of their cases. Six seldom use it, and six not as a routine practice. Five use atropine, seven use homatropine, one cocaine and homatropine, two use cocaine, and one uses duboisin in some cases.

BURNETT.

In order to make the quick changes necessary to accurately test the correctness of the cylinder in astigmatism, JACKSON (124) uses a sphero-cylinder, which by turning can be made a concave or convex cylinder in the meridian to be tested. These should be weak—from 0.25 to 0.75. BURNETT.

From an analysis of the examination of 1300 eyes with the ophthalmometer of Javal, LAUTERBACH (125) gives the following practical results: 1st, that the instrument will determine the axis and *amount* only of the corneal astigmatism; 2d, that the axis of the astigmatism is determined accurately in between 80 and 90 % of cases: 3d, that it will determine the actual astigmatism, after making a correction of 0.75 D, in about 45 % of cases.

BURNETT.

VII.—LIDS.

126. MASSELON. A rational operation for entropium following trachoma. *Ann. d'Ocul.*, cx., p. 27.

127. GALOWIN. On the operative treatment of congenital ptosis. *Chirurgisch Ljetop.*, xxxi., p. 345.

128. MAXWELL. An operation for the relief of symblepharon, or to enlarge a contracted socket so that it may hold a glass eye. *Ophth. Review*, xii., p. 189.

129. BATES. Report of a case of plastic operation for repair of the inner canthus. *Annals of Oph. and Otol.*, July, 1893.

130. WOODRUFF. The use of grafts of skin and of mucous membrane in the treatment of diseases of the eyelashes and lids. *Annals of Oph. and Otol.*, July, 1893.

MASSELON (126) in his entropium operation endeavors to fulfil two indications: 1st, to remove the orbicularis fibres that run parallel to the lid margin, and by their spasmodic contraction press the lid margin against the cornea; and 2d, to remove the thickening of the tarsus, and thus restore its flexibility. After clamping the lid, an incision is made 2-3 *mm* from the lid margin, and through this the central fibres of the lid cut out. The clamp is then removed, and all the prominent portion of the tarsus that can be felt with the finger is cut off. SULZER.

GALOWIN (127) calls attention to the fact that after the Panas operation for ptosis, the strip of skin lying under the brow preserves its epidermis, causing a constant unpleasant secretion of sebum, epithelium, and pus cells from the wound. Galowin believes that previously shaving off the epidermic layer of the skin which comes to lie beneath the bridge of skin, would cause union of this fistulous passage, without interfering with the success of the operation. He also prefers to make the downward incisions curved instead of angular. HIRSCHMANN.

MAXWELL (128) dissects up a bridge of skin parallel to the edge of the lid. The incision is deepened so as to communicate with the conjunctival incision, and the fold of skin is then pressed in and sutured to the conjunctiva. WERNER.

In BATES'S (129) case the inner canthus of the right eye, reaching to near the centre of the lower lid, was removed on account of an epithelioma. The deficiency was filled by a square flap taken from the centre of the forehead above the root of the nose, which was split in two when it was turned down, one part forming the upper the other the lower lid. It readily healed, and the shrinkage was but little nineteen months after the operation. BURNETT.

In lesser degrees of entropion and trichiasis where the operation of Hotz or Arlt is not necessary, WOODRUFF (130) splits the lid at the edges, and having dissected off the skin with the

cilia attached for a sufficient distance, places in the cavity a graft of mucous membrane from the inside of the lower lip, with the usual precaution in making such grafts. No sutures are used. He has treated satisfactorily eight cases in this way.

BURNETT.

VIII.—LACHRYMAL APPARATUS.

131. TERSON. The glands of the lachrymal caruncle and inflammatory encanthis. *Arch. d'opht.*, xiii., 6, p. 335.

132. KIMURA, TAKUSO. On the extirpation of the lachrymal sac. Inaug. Dissert., Zurich, 1893. *Klin. Monatsbl. f. Augenheilk.*, xxxi., p. 350.

133. MÜLLER. On the extirpation of the lachrymal sac. *Ibid.*, xxxi., p. 350.

134. ROCKLIFFE. Panophthalmitis following lachrymal-sac affections. *Trans. Ophth. Soc. Un.* K., xiii., p. 24.

135. SANDFORD. Enlargement of both lachrymal glands, causing closing of the palpebral apertures; removal. *Ibid.* xiii., p. 22.

TERSON (131) found in the caruncle, besides numerous sebaceous glands, in almost every case a tubulo-acinous gland of one or more lobes having one or two ducts. This is not to be regarded as the analogue of Harder's gland in animals, but as an accessory tear gland, such as are found according to Terson in the conjunctiva. Sweat glands were not found. Since almost all the elements of the lid margin are found in the caruncle, its structure and location would justify its being considered a portion of the lid, a view which has pathological support in an observation of Terson's, who saw after a furuncle on the upper lid a second one develop in the caruncle and destroy it, and a third one form later on the lower lid. v. MITTELSTÄDT.

According to KIMURA (132) the extirpation of the lachrymal sac is indicated in all cases where the treatment by means of sounds is not successful. He describes 18 cases from Haab's clinic. In 11 cases there was recovery in 8–11 days, in 5 cases in 15–20 days; in 3 cases the recovery was delayed by the formation of an abscess.

MÜLLER (133) recommends the extirpation of the lachrymal sac in patients whose social or other conditions render probing impossible; in cases where the duct is completely obliterated;

when the wall of the sac is so thick that it cannot be expected to resume its natural condition ; where tuberculosis of the sac is suspected ; where besides blennorrhœa there is caries or syphilitic affection of the surrounding bone ; where a blennorrhœa of the lachrymal sac complicates a corneal process or a ripe cataract ; and in cases of excessively ectatic even though thin-walled lachrymal sacs.

In ROCKLIFFE'S (134) cases hypopyon keratitis followed dacryocystitis, and finally led to panophthalmitis.

WERNER.

SANDFORD'S (135) patient, a man æt. fifty-six, had also enlargement of the lymphatic glands in the temporal region ; the parotid and submaxillary glands, the tonsils, and adenoid tissue or pharynx were also hypertrophied. No inflammatory symptoms. Microscopically the growth proved to be adenoma.

WERNER.

IX.—MUSCLES AND NERVES.

136. WAHLFORS. On squint and its cause. *Arch. f. Augenheilk.*, xxvii., p. 207.

137. BOURGEOIS. Operative treatment of strabismus. *Rec. d'opht.*, 1893, No. 4, p. 211.

138. PECHDO. On miner's nystagmus. *Annal. d'Ocul.*, cx., p. 92.

139. BORTHEN, LYDER. On recurrent oculo-motor paralysis. *Klin. Monatsbl. f. Augenheilk.*, xxxi., p. 339.

140. HANSELL. A case of convergent squint, with remarks. *Med. Record*, Aug. 9, 1893.

141. HANSELL. Functional exotropria. *Annals of Oph. and Otol.*, July, 1893.

According to WAHLFORS (136) squint depends upon a pre-existing muscular anomaly, which with the concomitant influence of other factors, among which innervation plays a weighty rôle, turns the eye into an abnormal position. With eyes having normally developed muscles the balanced position is that of parallelism. If with emmetropia there is muscular balance or but slight deviation, and the muscles are normally developed and binocular vision preserved, it is highly probable that the eyes will functionate normally. If the deviation is greater, the excessive degree of convergence which the eyes already possess becomes marked with each accommodative effort.

Convergence in a measure precedes accommodation, and endeavors to turn the eyes to a point lying somewhat nearer than the fixation point. Thus binocular vision is lost, and the squint appears. The time at which the squint appears varies according to the degree of deviation from the balanced position to the position of parallelism, and to the readiness with which binocular vision is given up. As a rule the squint appears at the age when the eyes are first used for close work. If there is divergent deviation with emmetropia and the divergent position of balance not excessive, and the muscles well developed, there will scarcely be a disturbance of function; in the same measure that the deviation increases, however, the difficulty in keeping the eyes fixed becomes greater. If binocular vision is lost the eye soon squints out.

With hyperopia of low degree and normal muscular balance, the eyes may be used without discomfort, but with higher degrees of hyperopia, particularly when one eye is weak, there may be periodic convergent squint. With a convergent position of balance even low degrees of hyperopia may cause a marked disturbance in function. The strong accommodative impulse increases the previously excessive convergence, and the binocular use of the eyes is rendered difficult, since convergence tends always to exceed accommodation. If one eye has poor vision, so that binocular fixation is out of the question, the eye, as a rule, tends to remain in its position of balance, and we have convergent squint. The more excessive the deviation from the normal axis and the higher the degree of hyperopia, the sooner must the eyes give up the struggle for binocular fixation and pass into squint.

A divergent position of balance with hyperopia is not overcome by the increased effort at convergence. If the divergence is of higher degree and one eye weak, the eye may assume a permanent deviated position. Low degrees of myopia with normal position of balance cause scarcely any functional disturbances. In higher grades the absence of the accommodative impulse renders convergence difficult. A lesser degree of convergent position of balance with myopia leads to no functional disturbance or deviation in the position of the eyes. In higher grades there are always disturbances, particularly after correction with glasses. If one eye is blind or if binocular vision is interfered with through other causes, the eyes readily take on a divergent squint. The divergent position of balance in myopia is very unfavorable. The

defect in converging power is increased by the absence of accommodative impulse in the same measure that the refractive error increases. With lower degrees of divergent position of balance the eyes must combat the more difficult convergence and the consequent asthenopia ; with greater deviation the eyes pass at times into a periodic strabismus, and when the binocular vision is completely lost, diverge permanently.

PECHDO'S (138) observations on miner's nystagmus were made in the mines of the south of France, where nystagmus is frequent. The intensity of illumination has no influence on the nystagmus. In Carmaux the weakest lamps are used, and here there is no nystagmus. The height of the galleries is everywhere so great that the miners may work standing. Every unusual straining of the eyes is thus excluded. The frequency of the disease stands, however, in direct relation with the amount of gases in the mines.

SULZER.

LYDER BOTHEN (139) reports a case of trauma of the right brow, eight years after which an oculo-motor paralysis appeared, lasting three or four days, then disappeared and periodically recurred.

HANSELL (140), after stating his belief that internal squint is not always due to hypermetropia, amblyopia, or a preponderance of function of the interni, records his conviction that it is frequently associated with a vertical anomaly, and that this vertical anomaly must be corrected before a satisfactory correction of the lateral anomaly can be made. This vertical insufficiency should be carefully tested for in every case of convergent squint and removed before a correction of the other is attempted.

BURNETT.

In making a classification of the different varieties of exotropia from their causes, HANSELL (141) has one which he calls functional, and which exists independent of any refractive error and may be hereditary. In four cases of this kind, whose histories he gives, he made tenotomies, which for a time corrected the faulty position of the eyes, but they subsequently returned to their first condition. Such cases he thinks have a central, probably a nuclear origin, and are not benefited by prisms or operation.

BURNETT.

X.—ORBIT AND NEIGHBORING CAVITIES.

142. DEBIERRE. Symmetrical tumors of the orbit. *Soc. d'opht. de Paris*, 1893, June 6.

143. LEWIS, FRANK N. Osteoma of the orbit. *Med. Record*, May 27, 1893.

144. WALTER. A case of primary melano-sarcoma of the orbit. *Klin. Monatsbl. f. Augenheilk.*, xxxi., p. 357. .

145. FROMAGET. Congenital serous cysts of the orbit. Anophthalmus and microphthalmus. *Arch. d'opht.*, xiii., 6, p. 321.

146. SCHAPRINGER. On traumatic enophthalmus, with remarks on its pathology. *Klin. Monatsbl. f. Augenheilk.*, xxxi., p. 309.

147. MARX. Foreign bodies in the orbit as a cause of tetanus. Inaug. Dissert., Berlin, 1893.

148. WIEDEMANN. Empyæma of the frontal sinus. Inaug. Dissert., Berlin, 1893.

149. SMITH. Shot injuries of the orbit. *Med. News*, May 6, 1893.

In LEWIS' (143) case, a man aged twenty-seven had suffered two slight injuries of the head, near the right orbit. There developed a gradually increasing exophthalmus. Motility of the ball restricted upward, in other directions normal. V = $\frac{20}{40}$ with slight papillitis, and clear media. The tumor lay above the eyeball and extended behind it. The tumor, of ivory-like hardness, was chiselled off at its base. It had no pedicle, and measured 45 x 24 *mm.* Some days after the operation there was marked reaction, but the patient quickly recovered. An atrophy of the disc remained. BURNETT.

WALTER (144) removed a melano-sarcoma from the orbit of a woman aged forty-eight. It was located within the muscle funnel and was not adherent to the periosteum of the orbit. The eyeball, optic nerve, and muscles were scarcely affected, and therefore he concluded that the growth had its origin in the fatty tissue of the orbit.

FROMAGET (145) saw in an otherwise well-formed child microphthalmus on the left side, and an orbital cyst causing protrusion of the lower lid on the right side. The extirpated cyst showed three divisions, a stalk extending toward the optic foramen, united by a narrow opening with a large cyst, and separated from the latter by a fibrous wall a smaller cyst. The smaller cyst, whose outer wall resembled the cornea, was lined with a pigmented membrane and contained an opaque lens. The stalk represented the optic nerve, the nervous elements being wanting, the middle portion of the growth showed mucous membrane, and the small anterior

segment represented an atrophic eyeball. The case was compared with those previously reported, in which at the time of junction of the nasal and the superior maxillary process, a bulging of the nasal mucous membrane had taken place, forming a cyst which altered the optic nerve and eyeball in the manner described, and produced an apparent anophthalmus.

V. MITTLSTÄDT.

After describing two cases of traumatic enophthalmus, SCHAPRINGER (146) speaks of the ætiology. In his opinion the enophthalmus is due to a traumatic paralysis of the trophic nerve fibres of the retrobulbar fatty tissue.

MARX (147) reports the case of a boy aged eight who was struck in the right eye by a bean stalk. Offensive pus was discharged from the orbit and two pieces of wood were removed. After this, tetanus of the head developed with paralysis of the facial and oculo-motor nerves. The tetanus became better after the eye was enucleated.

Of 16 cases of empyæma of the frontal sinus, seen by WIEDEMANN (148), 7 could be traced to inflammation of the nasal mucous membrane, 2 to trauma, 1 to tuberculosis, and 1 to syphilis. In the other cases no cause could be ascertained. In 11 cases there was perforation, 6 times into the orbit, twice into the cranial cavity, and 3 times anteriorly. Of the 16 cases 13 were cured and 2 had a fatal ending.

In a case of shot injury of the orbit, SMITH (149) found that the telephonic probe discovered the location of the ball with great accuracy, and that as the autopsy showed, the blindness following such cases is not due to direct injury of the optic nerve.

BURNETT.

XI.—CONJUNCTIVA, CORNEA, SCLERA, AND ANTERIOR CHAMBER.

150. BURCHARDT. The treatment of gonorrhœal ophthalmia. *Centralbl. f. prakt. Augenheilk.*, 1893, p. 321.

151. HOAR. Prophylaxis and prevention of trachoma in the Austrian army. Safar, Vienna, 1883.

152. SCHREIBER. The sublimate treatment of trachoma. *Wiener med. Wochenschr.*, 1893, 38–40.

153. JITTA. Is trachoma the cause or consequence of infection? *Geneeskundige Courant*, 1893, No. 43.

154. ARMAIGNAC. Treatment of trachoma and lupus of the lids by medicamentous tattooing. *Annal. d'ocul.*, CX., p. 121.

155. BAYER. On herpes of the conjunctiva. *Corr. Bl. des Vereins deutscher Aerzte in Reichenberg u. Umgebung*, 1893, No. 10.

156. RAABE. Contributions to the pathological anatomy of the external diseases of the eye. Inaug. Dissert., Marburg, 1893.

157. GUITTIERREZ-PONCE. Heredity of pterygium. *Soc. d'opht. de Paris*, June 6, 1893.

158. KRAILSHEIMER. A case of subconjunctival cysticercus. *Med. Corr. Bl. d. Württemb. ärztl. Landesvereins*, 1893, No. 16, p. 125.

159. FRANKE. Investigations on the disinfection of the conjunctival sac, with remarks on its bacteriology. *Graefe's Arch.*, xxxix., 3, p. 1 (nothing new).

160. MORTON, A. S. Persistent membranous conjunctivitis. *Trans. Ophth. Soc. Un. K.*, xiii., p. 29.

161. GUNN. Case of pemphigus of conjunctiva in early stage. *Ibid.*, xiii. p. 30.

162. BRONNER. A peculiar case of membranous conjunctivitis. *Ibid.*, xiii., p. 26.

163. FRIEDENWALD and CRAWFORD. Calomel conjunctivitis. *Amer. Journ. of Ophth.*, Aug., 1893.

BURCHARDT (150) omits caustic applications in blennorrhœa altogether, but washes out the conjunctival sac several times daily with ½ % solution of nitrate of silver. When the secretion is abundant, it is washed out with 5 % chlorine water solution.

HOAR (151) gives first an historical sketch of trachoma, then a description of its etiology, course, and treatment. The second part contains prophylactic regulations against its diffusion, particularly among troops, and the other hygienic measures to be used in its treatment.

SCHREIBER (152) recommends 1:500 sublimate solution in chronic trachoma, particularly when there is pannus.

JITTA (153) believes that trachoma is not a contagious nor a specific disease, but that it may develop after any sort of conjunctivitis when it takes a slow course and constitutional causes act concomitantly. No specific bacteria have been discovered, and pathologically nothing characteristic is found. Clinical experience confirms this, for acute trachoma is not seen. The endemic continuance of trachoma is due to heredity, predisposition, and racial peculiarities. WESTHOFF.

ARMAIGNAC (154) tattoos trachoma and lupus, using 1:500 bichloride solution in place of India ink.

BAYER (155) observed a number of cases of true herpes of the conjunctiva, coming on with fever and general malaise. The second day the fever disappeared, and marked inflammatory symptoms appeared on the lids and conjunctiva. Yellow vesicles developed in a line parallel to and near the corneal margin. These soon flattened and became confluent, a grayish ulcer with irregular margins thus being formed. The case recovered in a few days, applications of boric acid solution being made. He remarks that herpetic conjunctivitis chiefly attacks adults, is associated with a rhinitis, and is usually referred by the patient to a coryza. HERRNHEISER.

RAABE (156) described 6 cases of spring catarrh. This consists in a proliferation of the epithelium, with consecutive proliferation of the stroma and infiltration. Besides this, he described a case of hyalin-amyloid degeneration of the conjunctiva.

KRAILSHEIMER (158), in a boy aged six, observed the development of a left-sided exophthalmus, which disappeared after six weeks. In the region of the superior rectus muscle there remained an elliptical fluctuating tumor the size of a hazel-nut, which, being incised, discharged pus and a cysticercus.

In MORTON'S (160) case the membranous inflammation started in the lachrymal sac, and finally caused sloughing of the cornea. During nine years after, a granular mass appeared on the upper palpebral conjunctiva, covered by membrane, repeated excision and cauterization failing to destroy it. The microscopic structure suggested epithelioma. WERNER.

In GUNN'S (161) patient, a boy, æt. fourteen, vesicles were found on the nasal mucous membrane, and a flat, yellow patch, like a flattened vesicle, on the upper palpebral conjunctiva; dryness and shrinking followed in a few weeks.

FROST related a case in which cysts formed in the upper cul-de-sac.

The writer has seen a well-marked case with bluish, very thin-walled cysts in the upper cul-de-sac, in a patient with pemphigus scars on the arms and legs. WERNER.

BRONNER'S (162) patient, a man, æt. forty-three, suffered from an attack of muco-purulent conjunctivitis, with the formation of a membrane adherent to the eyes of both lids closing the palpebral fissure; on puncturing it a quantity of yellow muco-pus spurted

out; the cornea was ulcerated. The formation of membrane lasted only three days, and was arrested by mitigated nitrate of silver. Microscopically the membrane was formed of coagulated fibrin and white blood corpuscles. No diphtheria bacilli.

WERNER.

FRIEDENWALD and CRAWFORD report 3 cases of severe conjunctivitis, which developed during insufflation of calomel into the conjunctival sac, while the patient was taking iodide of potassium internally. The conjunctivitis disappeared at once on a cessation of the iodide ingestion. They find that their experiments on rabbits coincide essentially with those of Schlaeke and others, and that the caustic action is a double result of the chloride of sodium in tears on the calomel primarily, causing the formation of a bichloride, and of the iodide excreted in the tears on this, and the action of these compounds on one another and the metallic mercury.

164. DE WECKER. Treatment of ulcers of the cornea by scraping and irrigation. *Annal. d'Ocul.*, cx., p. 5.

165. PUECH. On the employment of instillations of sulphate of quinine solution in the treatment of ulcerative keratitis. *Gaz. hebd. des Sciences méd. de Bordeaux*, Jan., 1893.

166. MELLINGER. Modern treatment of destructive corneal processes. *Corrbl. f. Schweizer Aerzte*, 1893, No. 16.

167. BRÜHL. On rodent ulcer of the cornea. Inaug. Dissert., Giessen, 1893.

168. v. HIPPEL, E. On parenchymatous keratitis. *Graefe's Archiv*, xxxix., 3, p. 204.

169. LIEBRECHT. A peculiar method of tattooing the cornea. *Münch. med. Wochenschr.*, No. 34, 1893.

170. FRÖHLICH. On partial kerato-plastic. *Arch. f. Augenheilk.*, xxvii., p. 99 (Two cases; failures. With remarks on the method of v. Hippel and on Wagenmann's investigations).

171. COLLINS, E. T. Observations on ring-infiltration of the cornea. *Ophth. Review*, xii., p. 221.

172. SCOTT, K. Reparation of staphylomatous corneæ. *Ibid.*, xii., p. 249.

173. SPICER, W. T. H. Kerato-malacia in young children. *Trans. Ophth. Soc. Unit. Kingd.*, xiii., p. 45.

174. SILCOCK. Conical cornea. *Ibid.*, xiii., p. 56.

175. Frost, W. A. Papilloma on cornea. *Ibid.*, xiii., p. 57.

176. Alt. A case of recurrent epithelioma finally removed by galvano-cautery. No relapse after three years. Previous to this sympathetic neuro-retinitis. *Amer. Jour. of Ophth.*, June, 1893.

De Wecker (164) combines the scraping of corneal ulcers with an irrigation of 4 per cent. boric acid solution lasting one or two minutes. After this aseptic dressing. He obtains from this procedure an immediate disappearance of the photophobia and pain, the clearing up of the infiltrated zone, and a speedy regeneration of the destroyed tissue. Sulzer.

Puech (165) obtained good results from the instillation of 1 per cent. solution of neutral sulphate of quinine in infected corneal ulcers. In phlyctenular keratitis quinine does not give better results than the remedies in vogue. Sulzer.

Mellinger (166) in slight cases of destructive corneal processes advises a single linear cauterization of the retrotarsal fold and washing out the conjunctival sac with sublimate (1:5000); in more severe cases the subconjunctival injection of sublimate (1:2000).

v. Hippel (168) examined two eyes with parenchymatous keratitis and iritis, and found that the opacities of the cornea in the stage of reparation, which are characterized by excessive vascularization, depend upon cellular infiltrations and changes in the fibrillar ground substance. To the clinical picture of parenchymatous keratitis corresponds anatomically a disease of all the membranes of the eye. It cannot be said with certainty whether the keratitis is secondary or an independent affection. In all probability parenchymatous keratitis may be produced by tubercular infection, which is then the so-called attenuated tuberculosis, which may be recovered from.

Liebrecht (169) closed a defect in the cornea by transplanting a flap of mucous membrane from the lip. Later he attempted to tattoo the white spot, but was unsuccessful on account of the vascularity of the scar. He then injected sterilized India ink with a Pravaz syringe and obtained a permanent cosmetic result.

Collins (171) records four cases of ring ulcers following perforation injuries of the cornea. Leber's explanation of this kind of ulcer does not seem to hold good for all cases, as in

three of these the seat of the wound was close to the edge, and not in the centre of the ring, the latter occupying always the same position whatsoever the locality of the wound. In one case the ring was complete twenty-four hours after the injury. Microscopically the cell accumulation is most marked midway between the anterior and posterior surfaces of the cornea.

WERNER.

SCOTT (172) excised portions of staphylomatous corneæ and sutured the edges of the wound, with good cosmetic results and invariable absence of irritation. WERNER.

SPICER (173) records cases of severe corneal troubles following measles, whooping-cough, varicella, and malnutrition; he has found eserine of great value in such cases. WERNER.

In SILCOCK'S (174) case removal of an elliptical wedge of cornea improved V from $\frac{20}{200}$ to $\frac{20}{30}$ with -5 cyl. $\diagdown_{65°}$

WERNER.

FROST'S (175) patient had a warty growth on upper lid and a white nodular swelling in centre of cornea of cartilaginous consistence. The microscope revealed a papilloma.

WERNER.

In ALT'S (176) case the patient, aged thirty-eight, had lost the right eye twenty-five years before after a long and painful inflammation—on the stump of which he had worn an artificial eye. Latterly the vision in the left was blurred ($\frac{20}{40}$), and Alt found a full-blown neuritis, which promptly disappeared on removal of the stump, in which was found a small bit of stone. Five years later an epithelioma developed at the sclero-corneal margin of the remaining eye, which was removed twice with the knife. It was finally burned off with the galvano-cautery, and there has been no return for three years. BURNETT.

Sections XII.–XXI. Reviewed by DR. SILEX.

XII.—IRIS.

177. RECHE. At what point should an optical iridectomy be made? *Arch. f. Augenheilk.*, xxvii., p. 147.

178. HEDDAEUS. On hemiopic pupillary reaction. *Deutsche med. Wochenschr.*, 1893, No. 31.

179. EVERSBUSCH. Spontaneous absorption of an iris-cyst. *Report of Heidelberg Ophth. Soc.*, 1893.

180. SAMELSOHN. On so-called attenuated tuberculosis. *Ibid.*, 1893.

181. GONZENBACH. A peculiar case of iritis serosa. *Beiträge zur Augenheilk.*, p. 45. Edited by Dr. Mellinger, Basle, 1893.

182. MORTON. Cyst of iris. *Trans. Ophth. Soc. Un. King.*, xiii., p. 58.

RECHE'S (177) conclusions are as follows: 1. It is not true that an artificial pupil to the temporal side precludes binocular vision. 2. In favor of the temporal pupil speak, (*a*) the less effort at convergence, (*b*) the dispersion of the rays of light which pass obliquely through the refractive media turned toward the object, and (*c*) the widening of the visual field outward.

HEDDAEUS (178) concludes that a differential diagnosis of cerebral or tract hemianopsia from the presence or absence of the hemiopic pupillary reaction, without other symptoms, is not justifiable.

GONZENBACH'S (181) case was peculiar in the large deposits on Descemet's membrane. Besides atropine, cocaine, and moist heat, linear cauterization at the limbus seemed to exercise a favorable influence.

In MORTON'S (182) case, a man, æt. sixty-three, there was no injury. A gray translucent cyst, covered by a few iris fibres, was situated at lower part of anterior chamber. After an attempt to remove it, the eye was enucleated on account of severe reaction. The cyst was lined by the usual laminated epithelium.

WERNER.

XIII.—CHOROID.

183. SAULA. A case of catamenial irido-choroiditis. *Rec. d'opht.*, 1893, p. 460.

184. BAGNERIS. Coloboma of the choroid and optic nerve. *Annal. d'Ocul.*, cx., p. 98.

185. FROMAGET. Fascicular leuco-sarcoma of the choroid; attack of glaucoma caused by an intra-ocular hemorrhage. *Soc. d'opht. de Bordeaux*, June 20, 1893, and *Annal. d'Ocul.*, cx., p. 202.

186. DARIER. A case of central choroiditis, in which vision was restored to the normal by subconjunctival injections of sublimate. *Soc. d'opht. de Paris*, Feb. 7, 1893.

187. GAGARIN. A case of essential phthisis bulbi. *Wjest. Opht.*, 1893, No. 2.

GAGARIN'S (187) patient, a girl aged thirteen, in poor circumstances, was treated 6 weeks for an essential phthisis of the left eye. There was — T 3, episcleral injection, small pupil, slight ptosis, redness of the lids ; on the cornea was a series of vertical folds, apparently on the surface, with small infiltrations and epithelial defects. From time to time there were remissions, followed by painful exacerbations. Quinine internally caused temporary improvement. After the use of a solution of muriate of quinine and muriate of morphine in the eye, the case recovered completely.

XIV.—GLAUCOMA.

188. KÖNIGSTEIN. The treatment of the most frequent and important diseases of the eye. 4th part. Glaucoma. Detachment of the retina. Braümuller, Vienna, 1893.

189. ELIASBERG. A case of blindness from glaucoma at the age of fifteen. Clinical contributions. *Arch. d'opht.*, xiii., p. 481.

190. NICATI. Sclerotomy and the treatment of glaucoma. *Ann. d'Ocul.*, cx., p. 189. (A priority claim in opposition to Knies.)

191. KNIES. A new method of treating glaucoma. *Report of Heidelberg Ophth. Soc.*, 1893.

192. BRAILEY, W. A. Steady failure of sight, with many symptoms of glaucoma, but without increased tension. *Trans. Ophth. Soc. Un. K.*, xiii., p. 62.

193. WALLACE. Glaucoma. *University Med. Mag.*, Sept., 1893.

KÖNIGSTEIN'S (188) treatise is broader than its title implies, giving an intelligent clinical and anatomical picture of glaucoma, with detailed therapeutic suggestions.

ELIASBERG'S (189) patient, twenty years old, had been blind in the right eye for five years, and the left had been weak for six months. There had been neither inflammation nor pain. There was a glaucomatous excavation in each eye, more marked in the left, and marked increase in tension. v. MITTELSTÄDT.

KNIES (191) advises cutting through the iris at the time the peripheric section is made in the scleral margin. This iridosclerotomy had been done with good result, especially in acute cases, where it is more easily performed. The danger of incarcera-

tion and prolapse of the iris is more surely prevented than in the operative methods now practised. The operation should be done under the use of eserine. The indications, preparatory and after-treatment, are the same as those of glaucoma iridectomy.

BRAILEY's (192) patient, a woman, æt. forty-eight, suffered from "haloes" and "mists," with contracted fields, no glaucomatous cup or increased T. Iridectomy produced temporary improvement. WERNER.

WALLACE (193) has had some excellent effects from the use of cocaine and eserine in cases of glaucoma of the acute and subacute forms. He thinks cocaine alone most useful in the painful forms. Photographs of these sections of a glaucomatous eye are given. BURNETT.

XV.—SYMPATHETIC OPHTHALMIA.

194. WAGENMANN. Demonstration of preparations from two eyes which had caused sympathetic ophthalmia. *Heidelberg Ophth. Soc.*, 1893.

Wagenmann (194) in both cases found micro-organisms in the ball and in the nerve sheath.

XVII.—LENS.

195. NEUBURGER. On the frequency of cataract in the different periods of life. *Centrabl. f. prakt. Augenheilk.*, xvii., p. 63.

196. FROMAGET. Congenital cataracts. Hereditary through six generations. *Ann. d'Ocul.*, cx., p. 200.

197. BAAS. A case of congenital coloboma of the lens from persistent fœtal tissue. *Klin. Monatsbl. f. Augenheilk.*, xxxi., p. 297.

198. GAYET. A case of double luxation of the lens. *Prog. médic.*, July 20, 1892.

199. MITVALSKY. Microphakia and its clinical bearings. *Klin. Monatsbl. f. Augenheilk.*, xxxi., p. 323.

200. HIRSCHBERG. On lamellar cataract in old persons. *Centralbl. f. prakt. Augenheilk.*, xvii., p. 226.

201. WINTERSTEINER. A case of unilateral double lamellar cataract. *Klin. Monatsbl. f. Augenheilk.*, xxxi., p. 300. (Six cases of unilateral lamellar cataract have been reported.)

202. v. HIPPEL. On the present status of cataract operation. *Münch. med. Wochenschr.*, 1893, No. 36, p. 669.

203. LANDOLT. A discission knife. *Arch. d'opht.*, xiii., No. 9, p. 529.

204. MOOREN. The limits of indication for discission. *Deutsche med. Wochenschr.*, 1893, No. 36, p. 857.

205. CHAUVEL. Ophthalmological studies. Affections of the lens. *Rec. d'opht.*, 1893, p. 191.

206. MACHEK. On cataract operation without iridectomy. *Praegt. Lekarski*, 1893.

207. PARINAUD. The methods of preventing prolapse of the iris in simple extraction. *Soc. d'opht. de Paris*, March 11, 1893.

208. DARIER. Treatment of infectious processes after cataract operation. *Heidelberg Ophth. Soc.*, 1894.

209. DE WECKER. Daviel's modifications of his section. Historical reminiscences concerning the extraction of cataract. *Arch. d'opht.*, xiii., p. 401.

210. DE WECKER. Extraction with a triangular or oval flap. *Ibid.*, xvi., No. 7, p. 412.

211. MELLINGER. Injurious effect of cocaine on the primary union of corneal wounds, with special reference to the disturbances in the course of recovery of extraction wounds after the use of cocaine. *Beiträge zur Augenheilk.*, Schwabe, Basle, 1893.

212. FUKALA. Extraction of the lens in myopia. *Heidelberg Ophth. Soc.*, 1893.

213. CZERMAK. Eye operations. Parts iii. and iv. Gerolds Sohn., Vienna, 1893.

214. MOORE, WM. OLIVER. The after treatment of cataract extraction. *Med. News*, Sept. 2, 1893.

NEUBURGER (195) comes to the conclusion that the probability of cataract increases progressively from the fiftieth year to the eightieth and from then on seems to decrease.

FROMAGET (196) observed the inheritance of compound lamellar cataract through six generations. Heredity alone seemed to be in play, for there was no consanguinity. Only the female line was affected.

According to MITVALSKY (199) microphakia is shown by increased depth of the periphery of the anterior chamber, iridodonesis, and possibly visibility of the lens margin.

HIRSCHBERG (200) reports 4 cases of operation for lamellar cataract in patients above forty, thus disproving the assertion that lamellar cataract is not found beyond that age. This view has been held because lamellar cataract changes in the course of years and often is difficult to recognize in old age.

v. HIPPEL (202) gives a short sketch of the way in which we have arrived at the present cataract extraction. He always operates with iridectomy and considers important the removal of a large piece of capsule with the forceps. The cosmetic disadvantage of iridectomy does not balance the danger of prolapse, which often gives rise to infection later. In order to get as good vision as possible he makes a secondary operation in 33 % of his cases, mostly in the 3d week. 96.4 % of the eyes operated had vision $1-\frac{1}{10}$. There were 0.8 % of losses (how large was the series?).

For discission LANDOLT (203) uses a needle with a double-cutting edge in order to avoid tearing the capsule. He advises that the incision be made not in one meridian but in a circle parallel to the plane of the iris, almost perpendicular to the visual axis, in order to injure the vitreous as little as possible and prevent infection.

MOOREN (204), as early as 1859, removed the lens in several cases of high myopia, but gave up the operation, after losing an eye from irido-choroiditis. He formerly performed discission with the needle, but now with the Graefe knife. Artificial ripening may be done at any period and at any age. When arteriosclerosis exists, acute glaucoma may be brought on. He had had bad results with Förster's maturation. Lamellar cataract is now always extracted. He had made 766 secondary operations trying all methods. Now only discission is done. If one incision is not successful, another is made a few days later in the opposite direction. Graefe's knife is used also for iridotomy. If the opening closes by exudation when the operation has been well done and the ball is of normal consistence, lues should be suspected.

CHAUVEL (205) gives a review of the cases of eye disease which he has seen in the last 15 years in the military hospital Val-de-Grace, in Paris. He notes the position of the first opacities, the average age of the patient, and the time required for the opacity to become total, and also the frequency of secondary cataract, of prolapse of iris, of loss of vitreous, and the refraction of the aphakic eye. In several patients who had suffered from conjunctivitis before the operation, Chauvel saw an obstinate conjuncti-

vitis follow the operation, which could only be cured by prolonged rest. This subacute conjunctivitis had no ill effect on the healing of the wound. In some cases it seemed to depend upon a marked arthritic diathesis, in others upon the prolonged bandaging. SULZER.

MACHEK (206) makes a more linear sclero-corneal section, the middle part in the cornea and the two ends in the sclera. This section on account of its length and lack of resistence allows the easy delivery of the lens, the iris is less contused, prolapse is less frequent, and there is no escape of vitreous. The after-treatment is, as a rule, longer, for the wound does not close so soon. In ten cases he opened the capsule with the knife during the section. After the extraction of the lens and removal of the elevator, the iris spontaneously undergoes reposition. The average stay in the hospital was 19 days. The vision was neither better nor worse than after the Graefe operation.

He operated ten patients in one eye according to Graefe's method, and in the other eye according to the method described. The resulting vision was not particularly different in the two. They were two cases of extensive prolapse of the iris. In one iridocyclitis resulted and sympathetic inflammation which necessitated enucleation. HIRSCHMANN.

PARINAUD (207) differentiates between primary and secondary prolapse of the iris after simple extraction. The primary prolapse is that which forms immediately after the operation when the corneal section has been made too peripheric. The tendency to its formation is shown by the irregular shape of the pupil. It may be prevented by making a proper corneal section and by performing iridectomy after the extraction when prolapse threatens.

The secondary prolapse arises when, in the course of the first forty-eight hours after the operation, the united edges of the wound suddenly open again and permit the rapid escape of the aqueous. It comes on chiefly after a proper section with good coaptation of the edges and quick union. In order to prevent it, Parinaud makes a corneal incision that permits the aqueous to trickle through for forty-eight hours. This is obtained by entering the knife as if for making a high flap and then turning the edge sharply upward at the end of the section. SULZER.

DE WECKER (209) describes some notes suggested by Daviel, and reported by Moraud on an improvement in his method of extraction. This was expected to prevent prolapse of the iris by

making a triangular flap with knife and scissors. Daviel, according to De Wecker, did not defend his well-known procedure up to the time of his death. The operations for secondary cataract, done in Daviel's lifetime, total extraction of the secondary cataract when there were no adhesions, and partial extraction when there were adhesions, are the same as those discussed in the Paris Ophthalmological Society 130 years later.

De Wecker discovered a letter from D'Apples, published in 1762, in which he described an extraction made by Daviel in 1761. He made an incision with the knife from the inner margin of the cornea downward, and from the lower end of the incision made a cut upward and outward with the scissors, obtaining thus a triangular flap whose base lay in the horizontal diameter of the cornea. In 1762, according to the reports, his flap was directed outward. An accurate description of the size and position of the section cannot be found. De Wecker gives two drawings showing what he supposed the flap to have been like.

DR. WECKER (210) states that Schöler's operation for secondary cataract, making the incision with a lance and cutting through the cataract, was described by the late Dr. Prouff, in 1888.

V. MITTELSTÄDT.

MELLINGER (211) comes to the following conclusions: Cocaine disturbs the first firm union of corneal wounds, in a measure varying with the strength and quantity of the solution used. The disturbance depends upon the prevention of the union of the lamellæ and the difficulty in the formation of a coagulation in the parenchyma of the cornea. The cause lies in the action of the cocaine on the elasticity of the cornea and also in the absence of lymph in the parenchyma which the cocaine causes. In consequence of this there is a purely epithelial union having little resistance.

MOORE (214) prefers the combined operation for extraction, and uses the figure-of-8 roller bandage as a dressing, with the avoidance of dark rooms, and does not insist on close confinement to one position in bed. He does not remove the bandage until the end of the fourth day. The average duration of hospital treatment was ten days, the shortest being three days, during which time perfect union of the wound had taken place.

BURNETT.

XVIII.—RETINA AND FUNCTIONAL DISTURBANCES.

215. WALTER. A contribution to the knowledge of epidemic night blindness. *Arch. f. Augenheilk.*, xxvii., p. 71.

216. HERRNHEISER. On metastatic inflammations in the eye and on septic retinitis. *Zeitschr. f. Heilk.*, xiv., p. 893.

217. SPEISER. On retinitis proliferans. *Beiträge zur Augenheilk.*, 1893.

218. FUCHS. Retinitis circinata. *Graefe's Archiv*, xxxix., 3, p. 229.

219. BOË. Treatment of syphilitic retinitis. *Rec. d'opht.*, 1893, p. 205.

220. BECKER, A. A contribution to the knowledge of glioma of the retina. *Graefe's Archiv*, xxxix., 3, p. 280.

221. HAAB. The more important defects in the visual field. Part 5 of Magnus's plates. Kern, Breslau, 1893.

222. GROENOUW. Is there a concomitant excitation in homonymous portions of the visual fields as Scheibe has affirmed? *Arch. f. Augenheilk.*, xxxii., p. 32.

223. MANZ. On scotoma scintillans. *Neurol. Centralbl.*, 1893, p. 474.

224. MAUTHNER. Amblyopia diabetica. *Internat. Klin. Rundschau*, 1893, Vienna.

225. LURJE. On the condition of the retinal vessels with sclerosis of the cerebral arteries and the other portions of the aortic system. Inaug. Dissert., Dorpat, 1893.

226. OHLEMANN. On the exaggeration of symptoms after injury of the eyes. *Zeitschr. f. Medicinalbeante*, pp. 494 and 584.

227. NIEDEN. On the simulation of eye disease and the methods of detecting it. Bergmann, Wiesbaden, 1893.

228. WILHELMI. On the question of simulation after injury of the eyes. *Zeitschr. f. Medicinalbeamte*, 1893, p. 585.

229. JOHNSON, W. B. Suppression of the visual image. *Ophthal. Review*, xii., p. 256.

230. CHISOLM. How positive mental impressions promptly cured a case of hysterical blindness. *Med. News*, Aug. 12, 1893.

WALTER (215) reports on 269 cases of epidemic night blindness. The epidemic recurs annually in the spring in places where the sanitary arrangements are poor, affects males and

females with equal frequency, and particularly such as have been previously attacked. The course is usually acute, but sometimes chronic. Russia is a favorite country, but there are many German localities that are visited by epidemics. The number of cases is inversely proportional to the general good condition of the population, and is particularly great after famines. Insufficient nourishment is a predisposing factor, to which a direct factor must be added, which alone may be the cause of the disease. The causes generally given, such as dazzling, over-exertion, and the like, were not in play in his cases, and he regards Adamük's view of the miasmic genesis of the affection as the most plausible. The chief symptom of the disease is the raising of the threshold excitation, and it begins as a rule with an alteration of the acuteness of vision. In some cases he found the discs pale, margins blurred, and the retinal arteries narrow. The treatment should be of a tonic nature, followed by cod-liver oil or strychnia

Herrnheiser (216) regards septic retinitis as a blood affection. Through the micro-organisms absorbed and their products, there is produced a chemical change in the blood, leading to extravasations of blood in the retina. The entire organism is infected and various organs suffer. In embolic ophthalmia there is a rapid increase in the inflammatory symptoms, in septic retinitis the condition often remains unchanged for weeks. Retinitis septica is not due to embolism, and micro-organisms are not found in the eye.

Speiser (217) reports three new cases of retinitis proliferans. In one the formations were beneath the vessels, in two others before them, and in the latter cases the discs were also affected. The cause of all the cases was intraocular hemorrhage.

Fuchs (218) reports 12 cases of a peculiar disease, sometimes occurring unilaterally, sometimes bilaterally, 10 in women and 2 in men. The youngest patient was thirty-eight, the eldest seventy-five. The disease is characterized ophthalmoscopically by the presence of a gray, or grayish-yellow, opacity in the macula and its neighborhood, which is surrounded at some distance by a zone composed of small white spots, or larger white patches. The vision is reduced on account of the central scotoma. The disease lasts for years, the changes in the fundus disappearing finally, or leading to permanent thickening of the retina; in either case the vision being permanently reduced. The changes are ascribed to an exudation of fibrinous fluid in the retinal tissues. Syphilis and arteriosclerosis are not factors in its production.

(These cases are not particularly rare, and are the result of retinal hemorrhage.—H. K.)

The observation of two cases of syphilitic optic neuritis, one recovering promptly under inunction, while the vision in the other grew quickly worse under mercury and improved when the mercury was discontinued, leads BOË (219) to advise caution in using mercury. For the specific treatment of refractory cases he recommends the use of lactate of zinc. SULZER.

BECKER'S (220) first case was characterized by the presence of diffuse opacity of the vitreous, which concealed the glioma, and the other by a spontaneous hemorrhage into the anterior chamber. Histologically he regards glioma as a sarcoma of nerve tissue, and adds that many of these tumors, on account of their lobular structure and the vascular relations, should be called angio-sarcomata. The cases were further characterized by a marked hyaline degeneration and calcification of the vessels.

HAAB'S (221) charts are designed for the purpose of permitting the student, by frequently referring to them, to become familiar in the course of time with the principal varieties of anomaly of the field of vision.

MANZ (223) is inclined, from his own observations, to consider dazzling as the cause of certain cases of scotoma scintillans, and to assume a peripheric seat of the lesion. He was able to cure the attack by pressure upon the eyes.

MAUTHNER (224) does not consider the percentage of diabetic eye disease very high. Not every case of cataract in elderly diabetic patients is of necessity a diabetic cataract. Hemorrhages, due to alterations in the vessel walls, are not rare, and give rise to intraorbital and intracranial disturbances. The importance of diabetes does not depend so much on the amount of sugar as upon the formation of toxines, particularly toxalbumens. The diabetic marasmus acts upon the lens and upon the accommodative and muscular apparatus. Its action upon the first is rapid and may manifest itself at any period of life. The diabetes arising from disease of the central nervous system does not affect the eye directly, but indirectly through the brain disease, which may cause neuritis, papillitis, etc. Diabetic amblyopia is rare, and should be diagnosed only when intoxication amblyopia can be excluded. Mauthner does not believe in a too strict anti-diabetic diet, but allows moderate quantities of the carbohydrates.

LURJE (225) examined the eyes of a number of individuals in whom the autopsy showed sclerosis of the basal arteries of the

brain. The ophthalmic artery in almost all cases showed a new layer of connective tissue between endothelium and elastica. The central artery of the retina and the ciliary arteries were, as a rule, more affected than the main trunk. In the larger retinal arteries there was fibrous or hyaline thickening of the intima, atrophy or hyaline degeneration of the media, thickening and condensation of the adventitia. In the capillaries hyaline thickening of the walls. In the veins often thickening and condensation of the walls. In sclerosis the ophthalmoscope shows tortuosity of the vessels, pulsation, narrowing of the blood current, white lines along the vessels, and irregularity of calibre.

OHLEMANN (226) describes the various forms of amblyopia, and the tests used in their detection, and report cases seen in the Berlin University clinic.

NIEDEN (227) gives in popular form a description of all the simulated diseases of the eye. We may mention particularly the cases of conjunctivitis kept up by putting chalk in the eye, which are soon cured by keeping the eyes carefully bandaged. He states that all his cases of simulation showed a visual field extending 32° from the fixation point, because there is a rivet at 32° on his perimeter.

JOHNSON'S (229) patient had convergent strabismus with amblyopia in the left eye, whose V = fingers at 6″; he subsequently lost the right eye through an injury and by education the vision of the amblyopic eye was improved to $\frac{10}{10}$. There was H. of 1.5 D, and he could read Jaeger I. WERNER.

In CHISOLM'S (230) case he detected the hysterical blindness of one eye by placing before the seeing eye the strongest spherical lens in the trial case. She then read No. 20 at twenty feet, with the presumed blind eye. His method of cure was to give some simple tonic pill, to be taken three times a day, with the positive assurance that at the end of the third day her vision would return. When the third day came he stood by, watch in hand, waiting for the expiration of the time, and with a continuance of the most positive assurances of the return of vision. A few minutes before the allotted time had passed, a faint glimmer of light was perceived, and in a few seconds full and perfect vision was restored. BURNETT.

XIX.—OPTIC NERVE.

231 VALUDE. Optic neuritis and atrophy from iodoform poisoning through a burn. *Soc. d'opht. de Paris*, Apr. 11, 1893.

232. LANDAU. A case of recovery from bilateral acute peripheric inflammation of the optic nerve. *Centralbl. f. Augenheilk.*, xvii., p. 266.

233 OTTO. Investigations on changes in the optic nerves in arteriosclerosis. J. Springer, 1893.

234. STILTZING. Clinical and anatomical contributions to intoxication amblyopias and idiopathic retrobulbar neuritis. Inaug. Dissert., Marburg, 1893.

235. SATTLER. On true tumors of the optic nerve and their surgical treatment.

236. BUZZARD. Atrophy of the optic nerve as a symptom of chronic disease of the central nervous system. *Brit. Med. Journ.*, Oct., 1893, p. 729.

237. VEASEY, C. A. Some observations on the frequency of pulsating veins, cilio-retinal vessels, and physiological excavation of the nerve head. *Annals of Ophth. and Otol.*, July, 1893.

238. PESCHL, CASPAR. Quinine blindness. *Med. News*, July 29, 1893.

A boy, aged twelve, with a deep and extensive burn treated with iodoform dressings, soon developed hectic fever and suppuration. VALUDE (231) saw him eight months after the accident, at which time he had vomiting, diarrhœa, and headache. The fever which had disappeared shortly before came on again and the patient became very anæmic. The vision rapidly diminished so that in a few days the patient became completely blind. When salol was substituted for the iodoform that had been used continuously, all the symptoms improved except the amblyopia. Sixteen months after the accident, eleven months after the first symptoms of intoxication, the condition was as follows. Both pupils react promptly. R v = fingers at 10 *cm*; L v = fingers at 20 *cm*. Color perception lost, optic discs white and atrophic without signs of previous neuritis. The retinal vessels are scarcely narrowed. The onset of amblyopia simultaneously with undoubted symptoms of intoxication renders it probable that the amblyopia was of the same nature. It is nevertheless not impossible that the amaurosis was due to the symptoms on the part of the nervous system that are frequently seen after extensive burns even without intoxication. SULZER.

In his valuable monograph based on years of study OTTO (233) discusses a variety of optic-nerve changes that has previously

excited little attention, viz., peculiar congenital forms of the optic nerves and pathological changes due to arteriosclerosis. First group: six cases of arteriosclerosis of the basal vessels without or with but slight changes in the form of the nerve. Apart from a partial thickening of the nerve sheath with increase in the number of nuclei, there were neither atrophic nor inflammatory processes nor changes in the form or arrangement of bundles and septa. Second group: fifteen cases of arteriosclerosis with marked changes in form (depressions, flattenings) in particular bundles and partial atrophic processes. With these he describes three cases of congenital anomalies of form, one showing a depression with a radial arrangement of septa, one a cleft, and one having a biscuit form. The individuals from whom the specimens were obtained were for the most part demented and ranged in age from thirty-nine to seventy-nine. With the ophthalmoscope no changes corresponding to the anatomical conditions could be found. The author's detailed description of the relations of the vessels and optic nerves explains the development of depressions from vascular pressure. None of his cases showed the ophthalmic artery taking a course tangent to the optic nerve, as Bernheimer describes. Like the entire nerve, particular bundles with their septa may show changes of form, and with this more or less atrophic changes, affecting sometimes the marginal bundles, sometimes the central, and at times both together. The nerve sheaths showed no marked changes. The vessels of the optic nerve had thickened walls, the carotid and ophthalmic varying degrees of sclerosis. Corpora amylacea were rarely absent. It is remarkable that when the central bundles are simply flattened, there are no changes in the nerve elements in a longitudinal direction. If these bundles become atrophic, the atrophy may be followed along the nerve, upward usually as an absence of the fibres, downward never as a complete absence of the fibres; besides this the septa are thickened, the nuclei increased in number, and the neuroglia reduced.

With slight flattening, and even with atrophic changes in the central bundles, the ophthalmoscopic picture may be normal, but when there is a marked lesion of the nerve the disc assumes a grayish discoloration. In the functional examination it should be remembered that usually the central portion of the nerve is the first to become affected. In an appendix it is stated that Fuch's peripheric atrophy of the optic nerve was found 11 times in the

periphery only, and 9 times in several neighboring layers and in the central bundles.

STILTZING (234) adds another to the 12 cases of retrobulbar neuritis that have been examined anatomically. He found, as in the published cases of tobacco amblyopia, marked new formation of connective tissue and vessels, with marked increase in nuclei in the interstices. The meshes were diminished in size, a portion of the nerve fibres being atrophic, the nuclei normally present being closer together, but not increased in number. In other meshes the nerve fibres were quite normal. The second portion gives the symptomatology and statistics of the cases seen in the Marburg clinic.

SATTLER (235), by true tumors of the optic nerve, means such as develop within the dural sheath. He classifies these tumors and speaks particularly of the myxofibromata. These arise from the arachnoid and surround the degenerated nerve or replace it. The chief symptoms are gradual protrusion, painful mobility, early disturbance of vision, choked disc, absence of subjective sensations of light, and absence of pain. The tumors are benign and almost never return after extipation. In endothelioma of the nerve sheath and glioma-sarcoma the prognosis is bad.

BUZZARD'S (236) paper deals fully with atrophy of the optic nerve, occurring in disseminated sclerosis and locomotor ataxy. As regards disseminated sclerosis, atrophy was found in 43 % of the cases; this is a very important sign in slow intermittent forms of the disease, with pseudo-hysterical symptoms; the author also points out that in these cases, between the limits of the fields for color and for white, there is an area in which colors are seen as different shades of gray, but that in true hysterical cases this does not occur. Transitory blindness without alteration in the disc also frequently occurs (retrobulbar neuritis). In tabes dorsalis the author only found 15 % with atrophy, and only 4 of these presented characteristic ataxy, which is rarely marked when optic atrophy occurs early. The atrophy is much more serious as regards sight than in disseminated sclerosis. WERNER.

VEASEY (237) tabulates 120 eyes, in which there was either pulsating veins, physiological excavation, or cilio-retinal vessels. He found of the first 58.3 %, the second 24 %, and the last 14 %. BURNETT.

In PESCHL'S (238) case, a man, while suffering from a malarial attack, took 30 grains of quinine in 24 hours and the next morn-

ing awoke totally blind. When seen two and one-half months afterwards, the central vision was nearly normal, but the visual field was narrowed to 3°. Under hypodermic injections of strychnia the field for white reached nearly the normal, but that for colors was more restricted. The discs still remained pale and the vessels narrow in calibre. BURNETT.

XX.—INJURIES, FOREIGN BODIES (PARASITES).

239. SCHLÖSSER. Extraction of iron splinters. *Heidelberg, Ophth. Soc.*, 1893.

240. STÜRZELER. On the employment of the electro-magnet in removing iron splinters from the eye. Inaug. Dissert., Zurich, 1893.

241. BETHKE. A contribution to the subject of magnet operation. *Beiträge zur Augenheilk.*, edited by Dr. Mellinger, Basle, 1893.

242. MALGAT. Filaria in the vitreous. *Rec. d'opht.*, 1893, p. 280.

SCHLÖSSER (239) reports two cases of extraction of pieces of iron from the eye by means of the electro-magnet. He had made a particular form of magnet that could be fitted to the attachments of an arc light. With this magnet he could draw a splinter of iron weighing 10 *mgr.* from the retina through the vitreous and the uninjured lens. In particular cases he advises making an incision behind the ciliary body and extracting the foreign body through this.

BETHKE (241) reports 30 magnet operations with 17 successes so far as removal of the foreign body was concerned. In 9 cases the foreign body lay on the retina. The final results were in 2 cases $V = \frac{5}{5}$ and $\frac{1}{2}$; in 1, $\frac{1}{10}$; in 1, $\frac{1}{12}$; in 1, $\frac{1}{8}$; and in 2, preservation of the ball. The total result was enucleation in 7 cases, phthisis in 2, simple preservation of the ball in 9, more or less vision in 10.

XXI.—OCULAR DISTURBANCES IN GENERAL AFFECTIONS.

243. MAGNUS. The principal types of change in the fundus in general diseases. Part iv., plates. Kern., Breslau, 1893.

244. VOSSIUS. A case of lightning injury of the eyes. *Beiträge zur Augenheilk.*, iv.

245. MOHOKION. Optic neuritis with acute myelitis. Inaug. Dissert., Berlin, 1893.

246. UHTHOFF. Investigations on the ocular disturbances occurring with syphilis of the nervous system. Clinical part, *Graefe's Archiv*, xxxix., 3, p. 126.

247. SAUVINEAU. Ocular paralysis in young infants. *Soc. d'opht de Paris* and *Rec. d'opht.*, Sept., 1893.

248. ZIEM. The relations between ocular and nasal diseases. *Monatschr. f. Ohrenheilk.*, 8 and 1893.

249. GROSSMANN. Disturbances of vision due to affections of the nose and accessory cavities. *Allg. Wien. med. Zeitung*, xxxviii.

250. TRANTAS. Total ophthalmoplegia and other ocular complications with inflammations of the sinuses. *Arch. d'opht.*, xiii., p. 358.

251. KNIES. Unilateral central disturbances of vision and their relations to hysteria. *Neurol. Centralbl.*, 1893, p. 570.

252. SOMMER. On the theory of cerebral disturbances of writing and reading. *Zeitschr. f. Psychol. u. Physiol. der Sinnesorgane*, v., p. 305.

253. DÉJERINE and VIALET. On the anatomical location of pure word blindness. *Soc. de biologie*, July 20, 1893, and *Annal. d'Ocul.*, cx., p. 204.

254. GALEZOWSKI. Visual troubles with syringomyelia. *Rec. d'opht.*, 1893., p. 546.

255. KOENIG. Disturbances of vision in Parkinson's disease. *Ann. d'Ocul.*, cx., p. 44.

256. GOULD. The pernicious influence of albinism upon the eye. *Annals of Opht. and Otol.*, July, 1893.

257. GIFFORD. Hemianopsia following grippe. *Ophth. Record*, May, 1893.

Besides a number of the usual drawings, Magnus (243) presents some of rarer conditions, such as syphilitic vascular disease of the retina, the consequences of arteriosclerosis, changes due to age, retinitis albuminurica in different stages, etc.

VOSSIUS's (244) case, a woman aged twenty-eight, besides singeing of the lashes and burning of the corneal epithelium in both eyes, had paresis of the internal rectus and muscle of accommodation on the right side, iridocyclitis in both, followed by partial atrophy of the right disc and posterior cortical cataract.

MOHAKION's (245) patient had slight fever, headache, and left optic neuritis, otherwise normal. Four days later neuritis began in the right eye. After admission to the clinic there developed paresis of both legs, disturbances of sensibility, and difficulty in micturition. He soon showed the picture of acute ascending myelitis, and died in two months. Mohakion believes that vasomotor influences through lesion of the cervical sympathetic are the cause of the ocular disturbances in myelitis.

UHTHOFF (246) reports on the clinical symptoms of one hundred cases observed by him of syphilis of the central nervous system. 40 per cent. showed pathological conditions of the disc, consisting of choked disc, optic neuritis, neuritic atrophy, and simple atrophic discoloration. Seven patients had hemianopsia. The optic conducting apparatus was thus involved in 50 per cent. of the cases. The chief cause was gummous tumor in the cranial cavity, more rarely basal gummous meningitis, at times syphilitic disease of the cerebral vessels with secondary softening, and in exceptional cases syphilitic periostitis of the orbit. Optic neuritis or neuritic atrophy was present in 12 per cent. of cases, frequently unilateral, and mostly caused by basal gummous meningitis, and more rarely by gummous tumors. The ophthalmoscopic changes did not always correspond to the disturbances of vision. Primary syphilitic optic neuritis is found more frequently than uncomplicated typical choked disc due to syphilis. Simple atrophic discoloration of the disc was found in 14 per cent. The nasal portion of the disc still showed as a rule a slight red reflex and the atrophy was in every case referred to disease lying farther back in the nerve. The chief causes were the basilar gummous meningitis, tumors, vascular affections with meningitis, hydrocephalus internus. Eight per cent. of cases had vitreous, choroidal, iritic, and corneal changes. It was remarkable with what rarity the retinal vessels showed changes, and also how rarely the ball was affected by syphilitic processes. 11 times there was homonymous hemianopsia, 6 times temporal hemianopsia, 5 times concentric contraction, 4 times preservation of an excentric segment of the field, 4 times central scotoma, and 7 times enlargement of the blind spot. Four cases of homonymous hemianopsia due to basal lesion of the tract showed an atrophic pallor of the disc in 7 other cases the papilla was normal 5 times, there was choked disc once, and once slight atrophic discoloration. Two cases should be mentioned in which the discs were pale and there was

transitory complete blindness, and 3 of the 5 cases of concentric contraction showed papillitis. The occurrence of central scotoma indicates a lesion in front of the chiasm. It should be remarked that permanent bilateral blindness is rare in syphilis although common in tabes and paralysis. One of his concluding paragraphs is: "If with tabes or paralysis we have optic atrophy with the vision remaining stationary or improving, a careful examination should be made in order to find whether there be not a descending pallor due to retrobulbar or basal syphilitic disease and not the ordinary progressive atrophy. The good results of treatment usually depend upon such false diagnoses."

SAUVINEAU (247) reports the history of a patient affected with infantile paralysis and paralytic divergent strabismus at the eighteenth month. The paralysis and atrophy of the lower extremities was recovered from; the strabismus remained, and now at the age of fourteen there is still diplopia. In this case the paralysis must be regarded as nuclear and as a localization of the polimyelitis. In a second case incomplete nuclear internal and external ophthalmoplegia appeared on one side after diphtheria.

SULZER.

In a very interesting paper ZIEM (248) described the anatomical relations of the eye to the neighboring organs, in particular the nose and antrum, and shows how many affections of the eye depend upon diseases of these cavities and are readily cured by attention to the primary disease.

TRANTAS'S (250) patient, aged twenty, developed a non-inflammatory exophthalmus and immobility of the ball, which was referred to exposure to cold. There was ptosis and iridoplegia. Interior and sensibility normal. The vision was almost entirely lost. In the floor of the orbit there was a hard non-sensitive elevation of the bone running backward and inward. Puncture of the antrum through the orbit and evacuation of considerable inoffensive pus led to some temporary improvement. The antrum was repeatedly punctured through the orbit and the canine fossa, and the general condition improved. Since empyæma of the antrum with absence of inflammatory signs in the orbit could not produce the condition described, Trantas supposed an intracranial cause, or one arising from the orbital fissure or the sphenoidal sinus. The probing of these cavities revealed bare bone but no pus. The author believes that many oculomotor paralyses and cases of blindness owe their origin to disease

of the sphenoidal sinus, which, as autopsies show, often accompanies empyæma of the antrum. v. MITTELSTÄDT.

KNIES (251) states that with anatomical changes central to the optic chiasm, visual disturbances must be bilateral. The chief symptoms are diminution of vision in all degrees, no marked disturbance of pupillary reaction, more or less marked consecutive contraction of the visual field, and color disturbances. For the cerebral nature speak sensory disturbances in the cornea, skin of the face, etc., the possibility of influencing the disturbances psychically, and the remarkable effect of remedies in many cases. The fundus is normal, even when the trouble has existed for years. Knies believes, however, that these cases are not of cerebral origin, since there is no point in the brain behind the chiasm where a lesion may cause a unilateral disturbance of vision. He refers the symptoms therefore to compression of the nerve at the optic foramen. The normal appearance is explained by the fact that the affection is located behind the entrance of the central vessels, and by the fact that the fibres lose their conducting power but are not destroyed. The implication of the optic nerve results from a dilatation of the vessels, which is due to a disturbance of cerebral innervation. When the latter is unilateral, there may be unilateral paralyses and disturbances of sensibility.

In an earlier publication, DÉJERINE (253) showed that the two chief forms of word blindness now known have different localizations. The word blindness that is accompanied by disturbances of speech and agraphia depends upon a lesion of the gyrus angularis and the gyrus supramarginalis, while the pure word blindness, characterized by the absence of disturbance of spontaneous writing and speaking, and by a certain difficulty in copying writing, is due to an interruption between the cortical visual centre and the speech centre. The purpose of this contribution by DÉJERINE and VIALET is to render the location of the latter more precise.

The very intelligent patient had suffered for four years with complete word and letter blindness. The ability to distinguish notes was also lost, while the patient read figures without difficulty, calculated as before, and wrote from dictation. Copying was difficult and the copy imperfect. There was right hemianopsia. The patient died suddenly ten days after developing paraphasia and complete agraphia without word deafness.

In the left hemisphere was found a fresh red focus of softening in the inferior parietal lobe and the gyrus supramarginalis. An old yellow atrophic focus occupied the lingual and fusiform lobes, the cuneus, and the apex of the occipital lobe. Secondary degeneration of the splenium and atrophy of the optic radiation. A series of 900 sections showed that the softening extended deep into the white substance in the whole extent of the calcarine fissure to the ependyma, where it had caused total destruction of the tapetum. The fibres of the longitudinal fascicle were totally destroyed.

The inferior longitudinal fascicle therefore appears to contain association fibres designed to connect the visual sphere with the speech centre. It is remarkable that the destroyed association connection is not restored. SULZER.

KOENIG (255) in a patient with paralysis agitans saw a permanent, regular, vibratory twitching of the upper eyelids that was manifest when the lids were closed. The oscillations were slight, and there was a slight rigidity of the lids noticeable when they were raised by the finger. Besides this, there were brusque movements of the fixing eyes upward and outward and at times spasms of accommodation. SULZER.

GOULD (256) has had an opportunity of examining the members of two families—seven in one and two in the other—and from the results of his investigations he concludes: (1)—That albinos are normally or even exaggeratedly healthy in body and mind; (2)—There is no discoverable influence of heredity in the cause or in the transmission of the peculiarity. (3)—The sole pathological influence of albinism is on the eyes, and these are photophobia, nystagmus, ametropia, especially high degrees of hyperopia, astigmatism, and amblyopia, and they are all directly traceable to the transparency of the iris, the photophobia by the excess and diffusion of light, the refractive anomalies by the pressure of the lids to shut out the light, and the nystagmus by the endeavors to localize and make definite the indistinct retinal images. The eyes should be fitted with the proper glasses as early as possible, and attempts may be made to artificially pigmentize the faulty tissues. BURNETT.

GIFFORD (250) reported a case of right hemianopsia with occipital headache coming on after grippe. The line of demarcation corresponded nearly to the vertical meridian. Two years later the condition had not changed.

BOOK NOTICES.

I.—**Ophthalmic Nursing.** By SYDNEY STEPHENSON, M.B., F.R.C.S. (Edin.). Pp. 188, small octavo, with 61 illustrations. London: The Scientific Press, Limited, 1894.

Mr. Stephenson's book is designed for the instruction of nurses in hospitals having eye wards. After a short chapter on the anatomy and physiology of the eye, he discusses the subject of contagion and infection, and then passes to remedies and their application. After this he describes the more common eye operations, and the instruments likely to be used, and the preparation, dressing, and after-treatment of operative cases. Following this is a description of the diseases for which hospital treatment is usually sought, with hints on their nursing, and an account of such manipulations as a nurse may be expected to perform. The book would seem to be well adapted for the purpose for which it is intended. W. A. H.

II.—**Klinischer Leitfaden der Augenheilkunde** (Clin. Guide of Ophthalmology). By JULIUS MICHEL, Prof. Ophthal., Univ. of Würzburg. Wiesbaden: J. F. Bergmann, 1894.

A well-printed, very handy, small octavo volume of 310 pages, with a good index. This little book is well arranged, remarkably complete, presenting the whole range of ophthalmology in the most comprehensive manner, especially the connection of ophthalmic with general diseases. There are no figures in this otherwise very recommendable compend. H. K.

III.—**New Truths in Ophthalmology,** as developed by G. C. SAVAGE, Prof. of Ophthalmology, Nashville, 1893.

"The author dedicates this little volume to the memory of S. D. Gross, whose advice given him was, *Study a Specialty*; and to Dr. George T. Stevens, M.D., whose original work has been of in-

calculable value to him in his search after truth, as it pertains to the science and practice of ophthalmology, his *Studied Specialty*." In the preface he says: "In presenting this little volume to ophthalmologists who read, the author feels that he is doing them a service that will be appreciated."

The handsomely gotten-up small octavo volume of 152 pages is a collection of papers which the author had published before in his *Ophthalmic Record* and other periodicals. It is convenient to have them in this form. The most original of the author's investigations are those on the oblique muscles. They are, as many other subjects contained in the volume, open to serious criticism, but they should be read, carefully considered, and repeated, in order to verify their "truth" and value. Many things in the volume are far from being new—for instance, there is not a shadow of novelty in the "operation of an artificial pupil through the centre of a soft cataract," except the startling title.

H. K.

IV.—**Anomalies of Refraction and of the Muscles of the Eye.** By FLAVEL B. TIFFANY, M.D., Prof. of Ophthalmology and Otology, Kansas City, Mo., 1894. A large octavo volume of 307 pages, large type, profusely illustrated.

This is a well-written treatise of the anomalies of refraction and motility, containing the principles of optics as applied to ophthalmology, a clear description of the eye, of the mechanism of accommodation, the methods of examination, ophthalmoscope, ophthalmometers, spectacle case, test-types, stenopëic apparatus, keratoscope (Placido), prisoptometer, retinoscopy, colored-glass test, perimeter, and a full exposition of M., H., and As. This, the optical part, occupies 218 pages, the muscular part 68. The mode of examination, prisms, Maddox, rod and double prism, and the phorometer, also how to detect and correct insufficiency of the oblique muscles according to Dr. Savage, are explained. Then comes a chapter on "Strabismus (Cross Eyes)," to measure its degree in linear and angular deviations, its causes and treatment by tenotomy and advancement. The results obtainable are illustrated by the histories of several successful cases, with handsome photographs of the patients before and after the operation. In conclusion there is a useful chapter on spectacles and the lens measurer, some office contrivances, and a set of test-types.

Dr. Tiffany's book is elementary, as a text-book should be.

It contains a few inaccuracies, for instance, on p. 224, near the end, in speaking of the muscles that are active in the different movements of the eye, the author says: "In looking inward and upward there is a combination of the superior and internal recti; downward and inward, the internal and inferior recti." In the former movement the assistance of the inferior oblique should have been mentioned, in the latter that of the superior oblique. The book seems particularly adapted, and can be heartily recommended, to those that want to drill themselves, either by private study or in taking courses at an ophthalmic institute, in the determination of optical and muscular anomalies of the eye.

H. K.

V.—**A Text-Book on Diseases of the Eye.** By Hy. D. Noyes, A.M., M.D., Professor Bellevue Hospital Medical College, New York. Second and Revised Edition. New York: Wm. Wood & Co., 1894.

This second edition of Dr. Noyes' excellent text-book is truly revised, and in some chapters rewritten. The unusually well-informed author has, with great industry, followed and utilized the progress of ophthalmology, so that his book may confidently be said to present faithfully the actual status of eye surgery. Numerous literary references do not only give credit to the workers in ophthalmology, but are a great help to those that read and write, and want to resort to the sources of knowledge. Particularly excellent are those chapters in which the dependence of eye disease on brain and general diseases is described,—chapter VIII., binocular vision and its disturbances; XVIII., the optic nerve; and XIX., amblyopia and amaurosis. The book, though less bulky than the first edition, is increased by 83 pages, because of being printed on thinner though sufficiently good paper. The illustrations, both the colored and plain ones, have received many additions.

H. K.

VI.—**Manhattan Eye and Ear Hospital Reports.** No. 1. Committee on Publication: D. B. St. John Roosa, M.D., Chairman; J. E. H Nichols, M.D., Secretary. January, 1894.

The above publication gives on 143 pages, with some illustrations, a classification of the diseases treated during the last year in the different departments (eye, ear, nose and throat, nerves) of the institution, with reports of the most noteworthy cases. These will be reviewed in our reports on the progress of ophthal-

mology and otology. Hospital reports are always welcome to the profession. H. K.

VII.—**Der Nystagmus der Bergleute (Miners' Nystagmus).** By Dr. A. NIEDEN, of Bochum, Prussia. Wiesbaden: J. F. Bergmann, 1894.

Dr. Nieden, well known by numerous valuable contributions to ophthalmology, publishes a very interesting monograph on a subject which of late has received a good deal of attention (Snell, in England; Dransart, in France; Romiée, in Belgium) and led to extensive discussions. He gives first an historical sketch of the subject, then the occurrence, pathogenesis, and treatment of the affection. Nystagmus is acquired only by coal-miners. Those affected, almost all had been engaged in their work more than ten or fifteen years. Only the so-called holers, hewers, or coal-getters (German, *hauer*; French, *haveurs, abatteurs*), *i. e.*, men that crouch on the floor—the French in certain mines are standing—and break the coal with a pike while almost constantly and forcibly turning their eyes upward by the dim light of a Pavy safety-lamp. About 5 per cent. of the workmen suffer from the affection. Romiée found a higher percentage. They have mostly good eyes; 20 per cent. only showed complications of the media or the inner tunics.

The disease is curable in all cases by:

1. The cessation of the hewer's work, with its forced and prolonged elevation of the eyes.
2. Leaving the work in the mines and their insufficient illumination.
3. Occupation by daylight or good artificial light.
4. Good nourishment.

Tonics (iron, strychnia, quinine) are adjuvants. Workmen that, when cured, return to their previous occupation, soon have relapses.

The brochure of 140 octavo pages is magnificently printed on excellent paper and handsomely illustrated by some engravings in the text and nine heliotype plates from flash-light photographs, showing the miners at their dangerous and dreary work. The book is instructive, interesting, and easy to read. H. K.

VIII.—**Through Blind Eyes.** By MAURICE DE LA SIZERANNE, translated by F. PARK LEWIS, M.D. Small octavo, pp. 154. G. P. Putnam's Sons. 1894.

This little book, written by one himself blind from childhood, whose life has been devoted to the instruction and the intellectual and social amelioration of the blind, is designed to awake popular interest in this unfortunate class, and is exceedingly readable.

The first part of the book treats of the physical, intellectual, and moral qualities of the blind, and is particularly interesting on account of the subjective nature of the author's observations. The second part is devoted to a sketch of the life and work of Valentine Haüy, the inventor of raised letters. The third part, on the schools for the blind, deals with their physical, intellectual, and moral education, and particularly their professional and industrial training. The fourth and concluding part, entitled the blind in society, traces the elevation of the social status of the blind that training has brought about, and the further advance that may be hoped for.

The translation is good and the book is well worth perusal.

W. A. H.

IX.—**The Refractionist.** A Journal of Practical Ophthalmology. Dr. F. F. Whittier, Boston, editor; Drs. Phillips, Southard, Coomes, Baxter, Park, and Marbourg, associate editors.

As science specializes itself in developing, so does journalism. Refraction and its anomalies are certainly a vast enough field of work to have a special organ. By collecting all the new discoveries and inventions it will render the oculist a great service, and stimulate research. A hearty welcome to the enterprise.

H. K.

ANNOUNCEMENTS.

The CONGRESS OF AMERICAN PHYSICIANS AND SURGEONS will be held in Washington, D. C., from May 29th to June 1st. The meeting of the Ophthalmological Society May 30th and 31st, that of the Otological May 29th, 10 A.M., at the Arlington House.

The INTERNATIONAL OPHTHALMOLOGICAL CONGRESS will be held in Edinburgh, Scotland, August 7th–10th.

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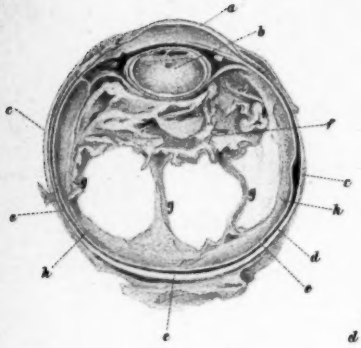

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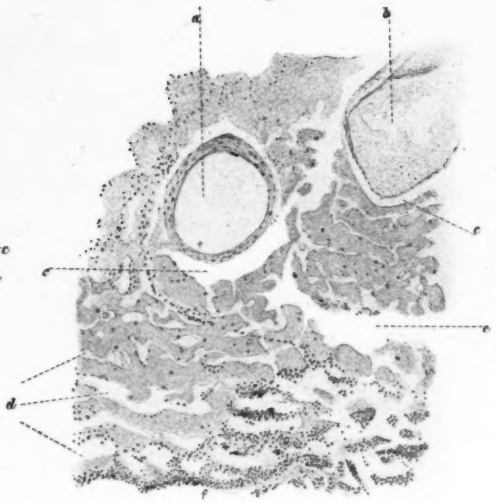

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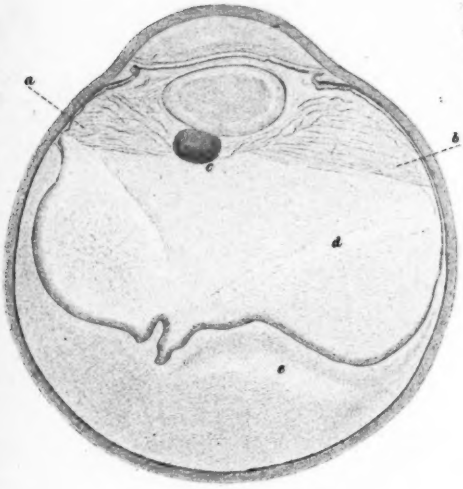

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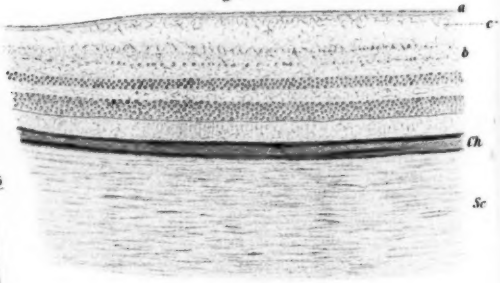

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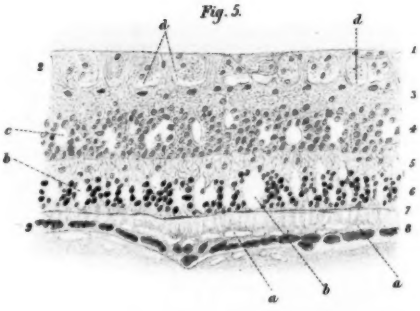

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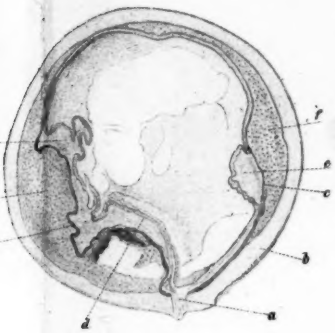

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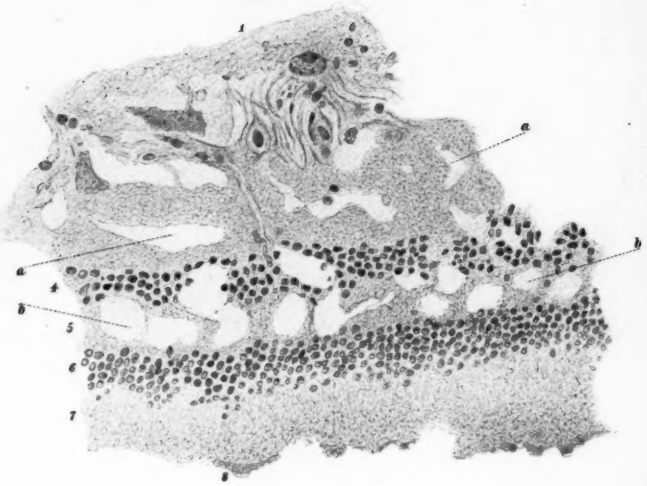

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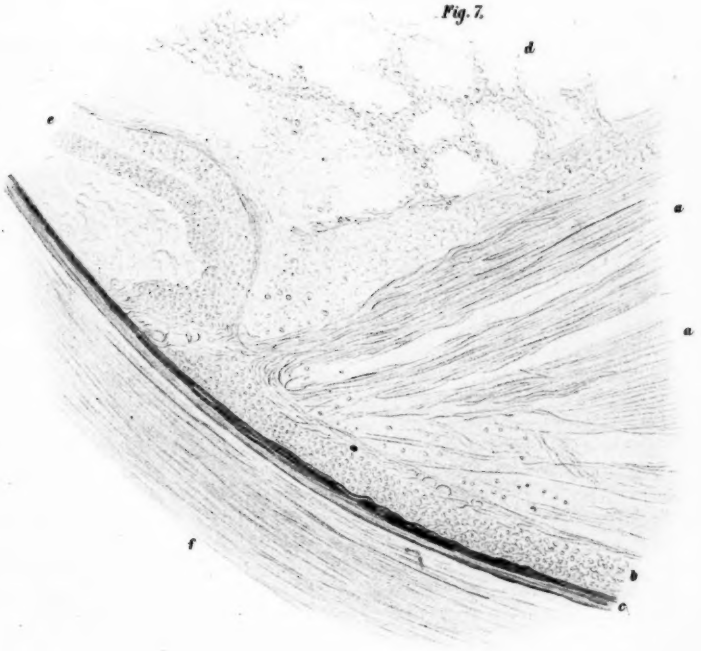

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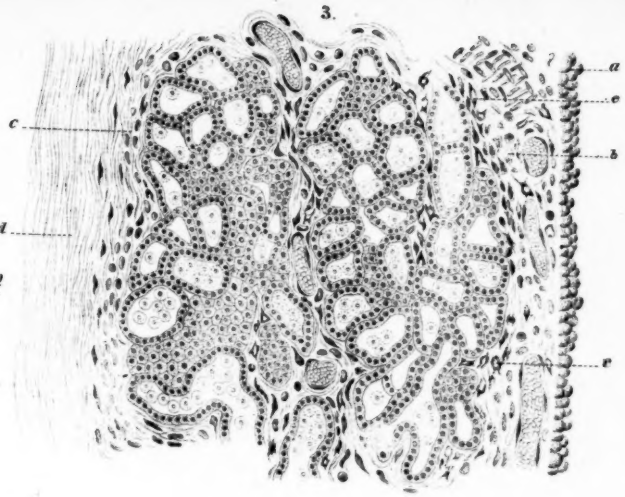

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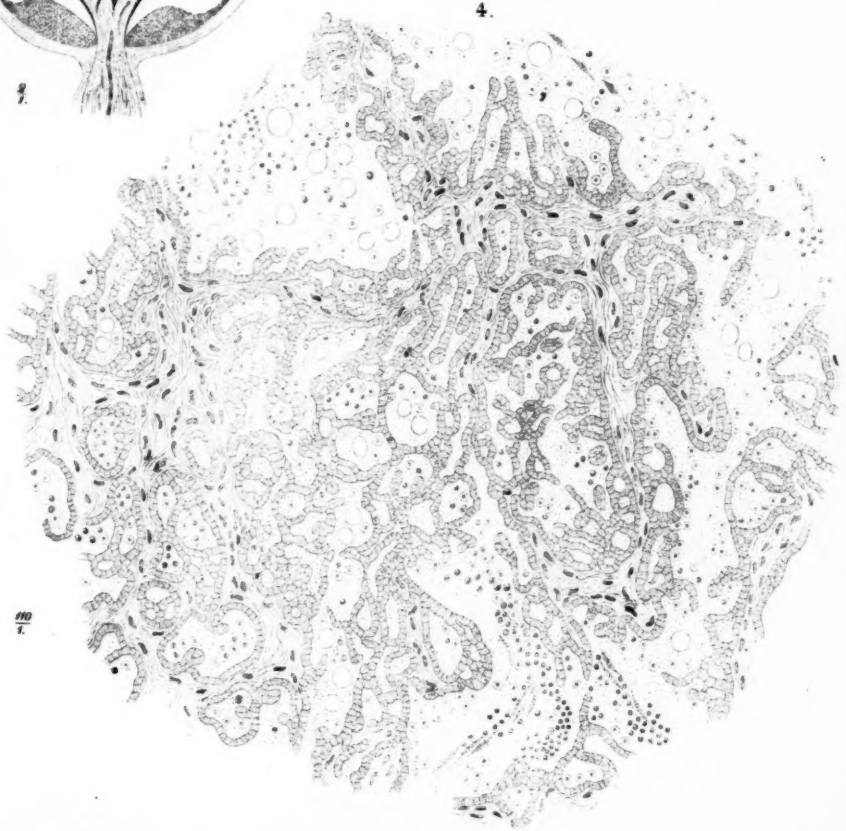

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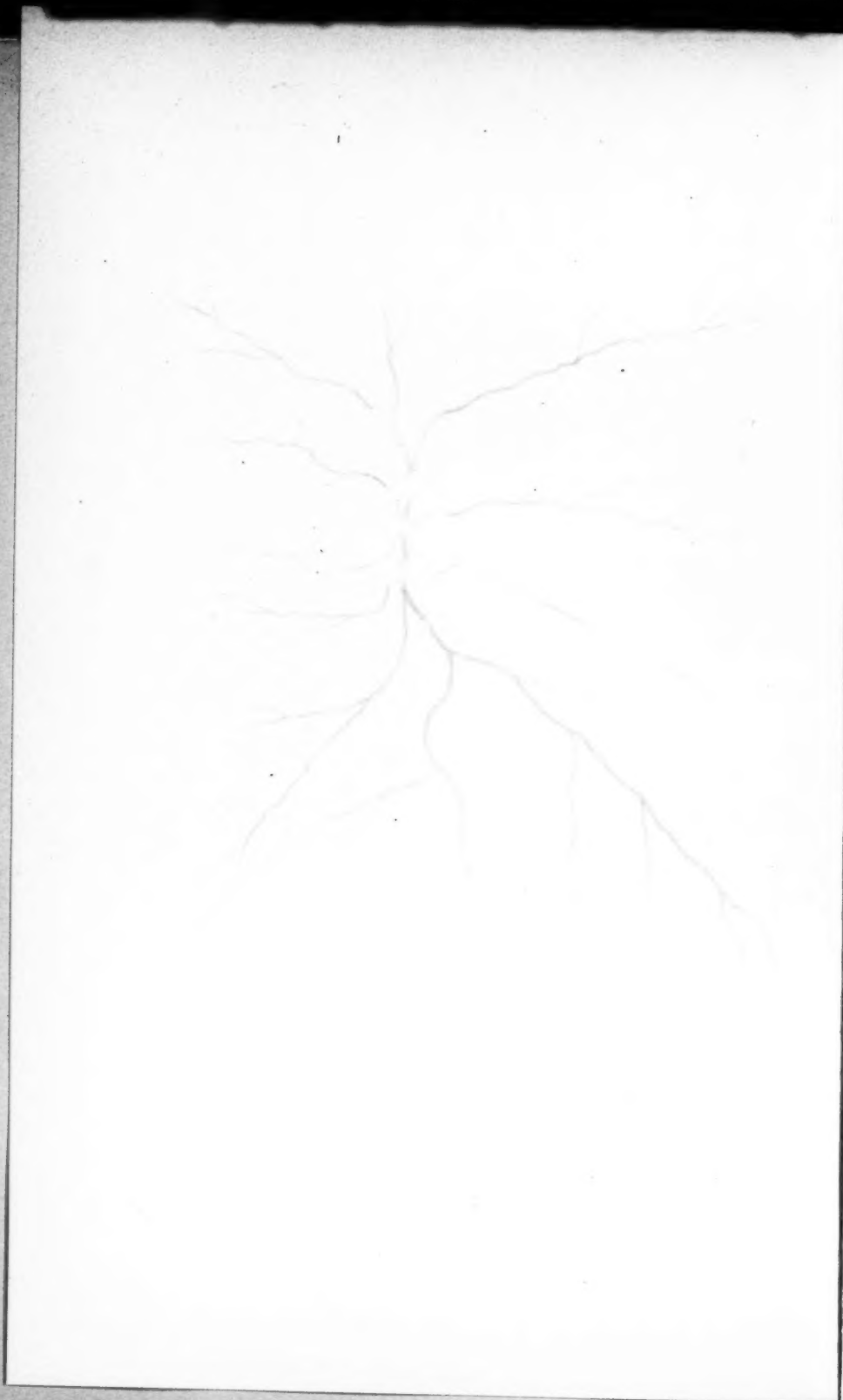

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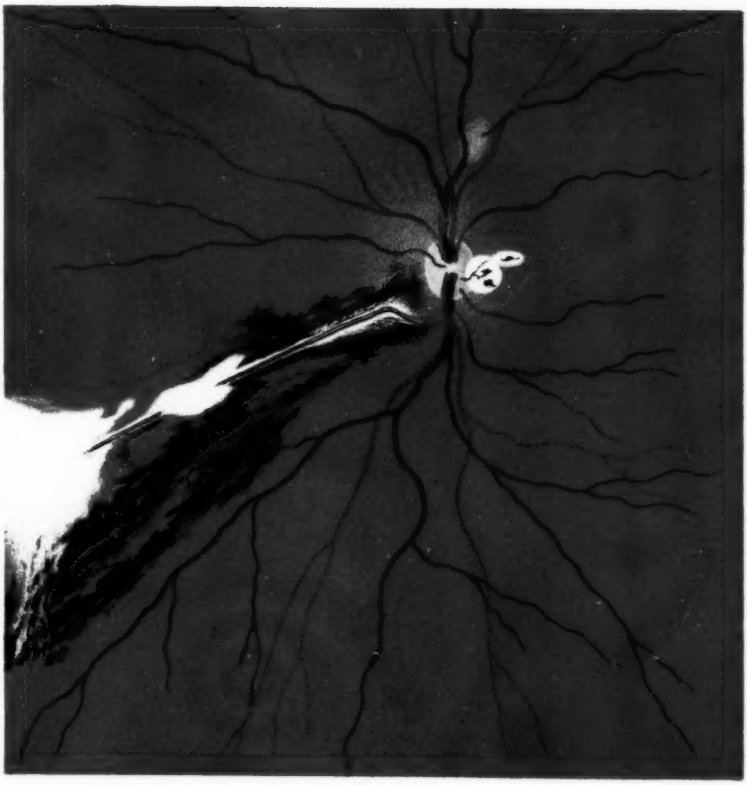

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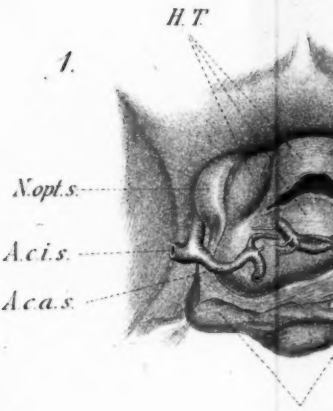

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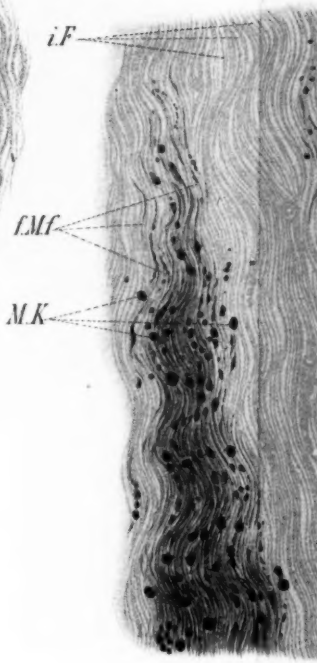

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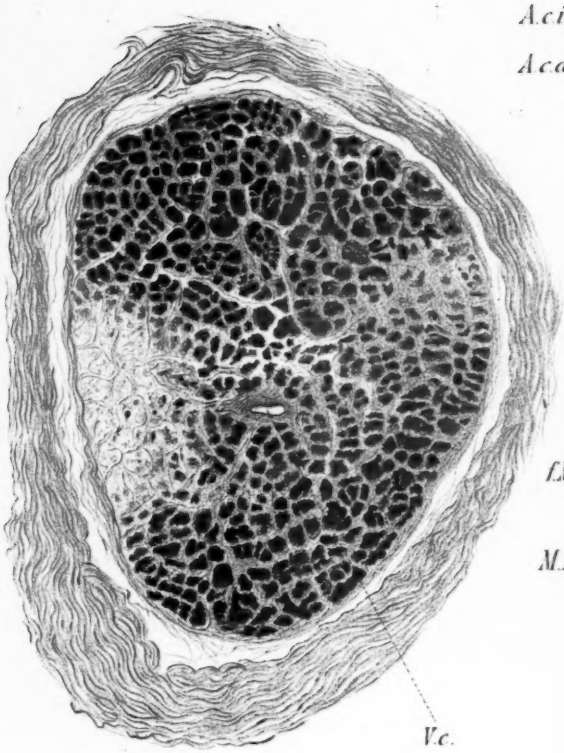

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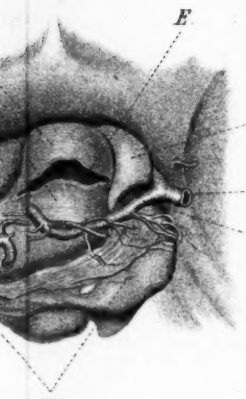

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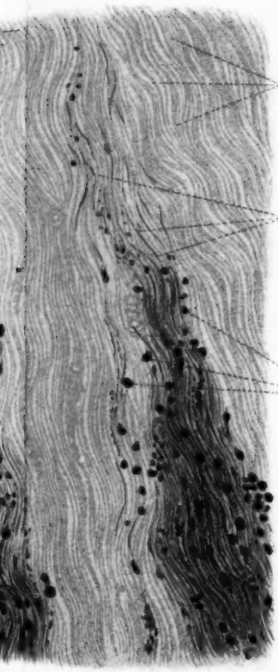

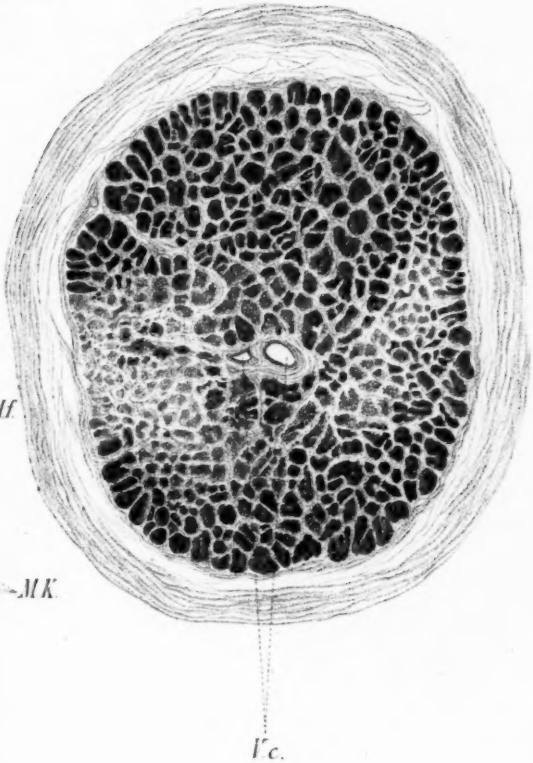

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